John C. Bulkeley
Portland Rd.,
Wallerawang.
1926.

We are proposing to publish, as a supplement to the biographical articles and personal references in the *Australian Encyclopaedia*, a volume containing a List of the most authentic portraits of the persons concerned. Where such a portrait consists of an original painting or drawing, we propose to give the name of the artist and also particulars of the size and the medium employed (oils, water-colours, pastel, pencil, or crayon), together with the name and address of the present owner or the name of the gallery or other institution in which it can be seen.

We should be glad to be supplied with any relevant information by the possessors or custodians of such portraits. No report is required of portraits in published books or magazines, but we desire to record engraving and lithographs published separately and also original photographs where other portraiture is not known to exist.

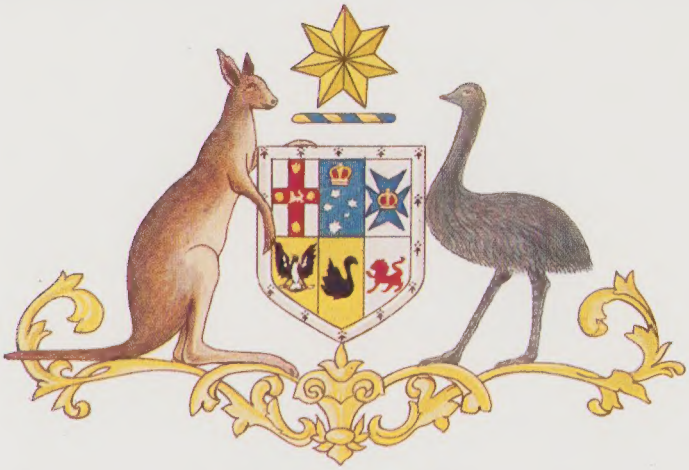
The proposed volume will be illustrated with small reproductions of any such accessible portraits as a liberal selection will admit. Apart from its natural human interest the book should be a valuable work of reference for those interested in the history, literature, and art of Australia.

ANGUS & ROBERTSON.

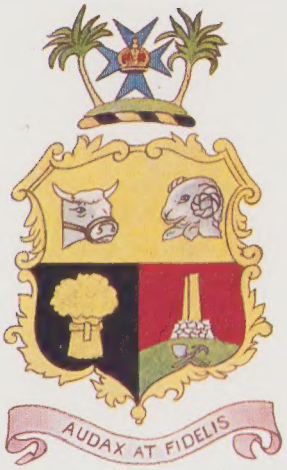
89 Castlereagh Street,
Sydney, Australia.

THE AUSTRALIAN ENCYCLOPAEDIA

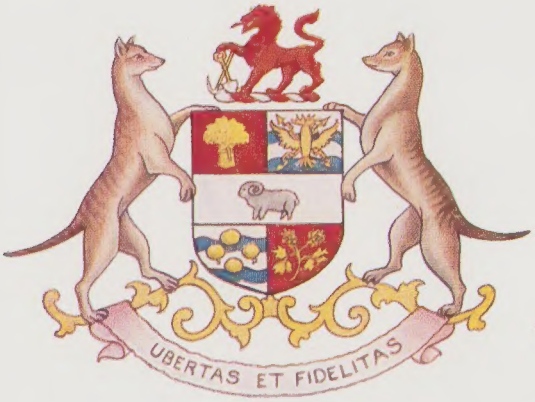
A&R



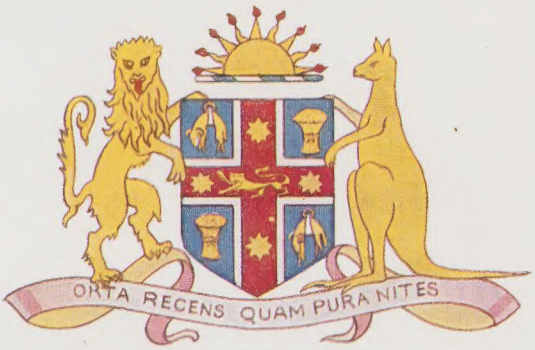
Commonwealth of Australia.



Queensland.

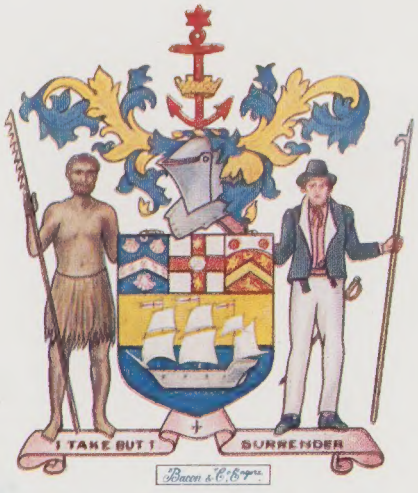


Tasmania.



New South Wales.

Victoria.



City of Sydney.

Drawn by C. R. Wylie.

Plate XXV

ARMORIAL ENSIGNS

THE AUSTRALIAN ENCYCLOPÆDIA

Edited by
ARTHUR WILBERFORCE JOSE
Author of *A History of Australia from the Earliest Times*
and
HERBERT JAMES CARTER
President of the Linnean Society of New South Wales, 1925.

VOL. II
M TO Z

AUSTRALIA:
ANGUS & ROBERTSON LIMITED
89 CASTLEREAGH STREET, SYDNEY
1926

All Rights Reserved

MAPS IN VOL. II

MANDATED TERRITORY OF NEW GUINEA 23
MELBOURNE AND SUBURBS 54
AVERAGE RAINFALL, APRIL TO OCTOBER 64
WET SEASONS AND STORM SEASONS 67
NEW SOUTH WALES 196
AUSTRALIA, SECTION ON EVERY THIRD DEGREE OF LATITUDE . . . 215
PAPUA 258
QUEENSLAND 350
SOUTH AUSTRALIA AND NORTHERN TERRITORY 481
SYDNEY AND SUBURBS 525
TASMANIA 536
VICTORIA 620
SYDNEY WATER-SUPPLY 638
WESTERN AUSTRALIA 652

M

Macadamia, a genus of the family Proteaceae, consisting of trees or tall shrubs with verticillate leaves, endemic in eastern Australia. The corolla-tube opens on the underside of the lobes of the petals before they separate; anthers shortly stalked, and produced into a gland or very short appendage; fruit a globular nut, with an exceptionally hard coat. *M. ternifolia* (Queensland Nut—but it is found also in northern New South Wales) is a bushy tree more than 30 feet high, with a stem diameter of 8 inches. The timber is firm and fine-grained, and takes a good polish. The tree (which reaches maturity in about seven years) is ornamental, and during six months of the year bears a crop of edible (but very hard-shelled) nuts of excellent flavour. They are sometimes sold as 'popple' or 'poplar' nuts—a corruption of Bopple Mountain near Gympie in Queensland, where they are plentiful. As they form a nutritious article of food for the aborigines, timber-getters are not allowed to fell the trees. In 1923 a thin-shelled variety was discovered on the Tweed River in northern New South Wales; it improves by cultivation, and is under investigation by the Queensland department of agriculture.

Macarthur, Sir Edward (1789-1872), born at Bath in England in 1789, was in 1790 brought by his father John Macarthur (q.v.) to Sydney and privately educated at Parramatta. He returned to England, and on 20 October 1808 joined the army as ensign in the 60th regiment (lieutenant, 1809; captain, 1819; major, 1826; lieutenant-colonel, 1841; colonel, 1854; major-general, 1858; lieutenant-general, 1866). He served in Spain under Sir John Moore through the campaign of Corunna, in Sicily, and again in Spain and in France under Wellington from Vitoria to Toulouse. His subsequent military career was undistinguished, but he established a reputation for administrative ability; in 1837 he was assistant adjutant-general in Ireland, and in 1851 became deputy adjutant-general in Australia. In 1855 he succeeded Sir Robert Nickle (q.v.) as commander of the British troops in Victoria, in 1856 administered the government of Victoria during an interregnum; he returned to England in 1860, and died in London on 4 January 1872. (C.B., 1857; K.C.B., 1862.)

Macarthur, George Fairfowl (1825-1890), third son of Hannibal Hawkins Macarthur, was born at Subiaco near Parramatta on 19 February 1825, educated at The King's School, Parramatta (he was one of its first pupils), and was afterwards coached by Dr. Woolls (q.v.) to fit himself for Oxford. This becoming impossible owing to his father's losses in the financial crisis of 1843-4, he studied for Anglican orders and was ordained deacon in 1848 and priest in 1849. In 1852 he was appointed to St. Mark's church on Darling Point, Sydney, and while in charge there opened St. Mark's collegiate school; this prospered so greatly that in 1858 he resigned the parish and moved his school to Macquarie Fields, about 27 miles south-west of Sydney. For the next ten years he devoted himself to the school, modelling it on the great public schools of England, and establishing the first cadet corps in Australia. In 1868 he was invited to become head of The King's School, which had been closed since 1864. Though the buildings were much dilapidated and half his pupils were not allowed to follow him from Macquarie Fields, he accepted the post for sheer love of his old school, and during 17 years rebuilt it with such skill and success that he was known as the school's 'second founder.' In June 1886 he resigned, and lived in retirement until his death on 16 June 1890.

Macarthur, Hannibal Hawkins (1788-1861), born at Plymouth on 16 January 1788, in 1805 migrated to New South Wales at the invitation of his uncle John, but after gaining some experience in wool-growing took a cargo of sandalwood to China for his uncle and returned to England in 1808. In November

1812 John Macarthur, finding himself detained in England because of his share in the mutiny against Bligh, persuaded Hannibal to go back to Sydney to manage the commercial side of his various enterprises; but the young man preferred wool-growing, purchased Captain Waterhouse's farm near Parramatta, and there superintended the shipping of John Macarthur's wool. When his uncle returned to Australia in 1817, Hannibal devoted himself to his own estate and in 1820 took up land at Arthursleigh near Goulburn, where he amassed a 20,000-acre estate. Curiously enough though his relations with Macquarie were consistently amicable he fell foul of that mildest of governors, Brisbane, who not only dismissed him from the magistracy but singled him and John Blaxland out as persons who could not be recommissioned when a new commission was issued. In 1830 he was appointed to the legislative council on the death of J. T. Campbell, and held the seat till the abolition of the council in 1843; he would then have been one of the nominated members of the new council had not Parramatta elected him as its representative. His political career was undistinguished. In 1848 he retired, became commissioner of crown lands at Braidwood and afterwards police magistrate at Ipswich in the Moreton Bay district, and in 1853 returned to England, where he died at Norwood near London on 26 October 1861.

Macarthur, JAMES (1798-1867), born at Parramatta in 1798 and in his early years taught by Huon de Kerilleau (see MITCHELL, JAMES), was taken to England with his younger brother William by their father, John Macarthur, in 1809, educated at private schools there, taken on a tour through France and Switzerland in 1815, and brought back to New South Wales in 1817. For some years thereafter he assisted his father in the management of Camden Park, taking also a minor part in the public life of the colony; he revisited England with petitions from the colonists regarding freer institutions, immigration, and the convict system, and while in London took the opportunity to publish in 1837 *New South Wales, Its Present State and Future Prospects.* Returning to Sydney in 1839, he was in October nominated to the legislative council. In 1843 he contested the election for the Cumberland seat, but was defeated, and refused to enter the council as a nominee; in 1848 he was elected by the Camden constituency, and moved the resolutions which sent Wentworth and Deas Thomson to England to ensure the passage through parliament of the act granting New South Wales responsible government. In 1856 Camden returned him to the new legislature, but ill-health forced him to retire in 1859; he refused Governor Denison's offer of a knighthood, visited England in 1860, was a commissioner for the colony at the London exhibition of 1862, returned to Sydney in 1864, and in June 1866 was nominated to the legislative council, of which he was a member when he died on 21 April 1867. He and his brother William were among the pioneers of the wine industry in Australia.

Macarthur, JOHN (1767-1834), born near Plymouth in Devonshire in 1767 and educated at a private school, was the second son of Alexander Macarthur who had been concerned in the Jacobite rising of 1745, fled to the West Indies thereafter, and eventually settled at Plymouth as an army agent. In 1782 John entered the army as an ensign, and at the close of the war in 1783 was placed on half-pay and retired to a farmhouse near Holsworthy, on the borders of Cornwall and Devon; here he read a good deal (principally English and Roman history and the general principles of law), and contemplated resigning his commission with a view to being called to the bar. In 1788, however, he was appointed to the 68th (Durham) regiment, and on 5 June 1789 exchanged into the New South Wales Corps (q.v.), reaching Port Jackson on 18 June 1790. On arrival he was sent as commandant to Parramatta. On 12 February 1793 he was granted 100 acres at Rose Hill, and on 1 April 1794 received a second 100-acre grant, a prize offered to the first man who should clear and cultivate 50 acres; here he erected a 'very excellent brick building,' and called the place 'Elizabeth Farm' in honour of his wife. In the same year he was appointed superintendent of public works by Lieutenant-governor Grose, and became paymaster to the regiment.

Meanwhile he made farming the serious business of his life. On 26 February 1796 he retired from the superintendency, and quarrelled violently with his successor and Governor Hunter; when they complained to the British authorities, Macarthur replied by charging Hunter with laxity—but apart from a voluminous correspondence nothing occurred.

In 1796 he imported merino sheep of poor quality from The Cape Colony and began experimenting with their wool, meanwhile adding to his estates and his influence with his fellow-officers (who were all traders at heart) by steady and profitable attention to his wheat-growing and stock-breeding. When he went to England in 1800 to investigate the merino breed more carefully, Governor King plaintively suggested to the colonial office that 'if Captain Macarthur returns here in any official character, it should be that of Governor, as one-half the colony already belongs to him, and it will not be long before he gets the other half.'

Returning to New South Wales in 1801, Macarthur embroiled himself during September in a quarrel with his commanding officer Colonel Paterson, and in the ensuing duel Paterson was badly wounded. King placed Macarthur under arrest, and then hoped to end the matter by sending him as commandant to Norfolk Island; but Macarthur refused to accept release from arrest and demanded a court martial, whereupon King sent him to England to stand his trial there. The results were equally unpleasant for both. Macarthur was promptly ordered back to New South Wales on the ground that all the witnesses were there and no trial could take place without them; the Duke of York, who was then commander-in-chief of the British army, issued a general order in which King was rebuked for trying to shift responsibility off his own shoulders, and Macarthur was told flatly that he had no right to demand a court martial if King chose to release him. This rebuke ended Macarthur's military career; he threw up his commission, and devoted himself to persuading important people in England that the finest wool in the world could be grown in Australia. Procuring merino rams of excellent quality from King George's own flocks, he went back to Australia in 1805 with a permit from Lord Camden, then in charge of the colonies, to choose 5000 acres of land in any situation he liked. The grant would have been for 10,000 had not Macarthur antagonized Sir Joseph Banks

by showing irritation at the great man's rather casual treatment of him; Banks retaliated by advising Lord Camden to halve the grant until Macarthur had fully proved his contentions about the quality of his wool.

Back in New South Wales, the eager wool-grower blocked his own path by insisting on choosing his 5000 acres at the Cowpastures, a reserve sacred to government-owned cattle. King protested, and referred the matter to England, but before an answer could be received he had been replaced in the governorship by Bligh. Meanwhile Macarthur had been allowed to occupy the disputed area provisionally, had transferred to it the major part of the stock from his Parramatta farms, naming it 'Camden Park' after the minister who had favoured him. Bligh, confronted at once with this *fait accompli* and with a renewed order from the colonial office to confirm the grant—and firmly convinced that this aggressive Macarthur was at the bottom of all the trouble with the New South Wales Corps which he had been sent out to settle—rated him soundly for wanting so much land, and took every opportunity to harass him. In 1807 a convict escaped in a schooner that had been chartered by Macarthur, and gave Bligh another grievance. Towards the end of the same year Macarthur imported two stills—for perfectly legitimate uses, he said; Bligh ordered that they should be reshipped, and that for the offence of importing them Macarthur should be tried by a criminal court, which in those days consisted of seven military officers and the judge-advocate, Richard Atkins. Macarthur resisted arrest and, when at last brought before the court, objected to its jurisdiction on the ground that Atkins was his inveterate enemy. Atkins ordered him to prison; the other officers granted him bail; Bligh intervened and had him thrown into prison on an escape warrant; Johnston, then in command of the Corps, signed an order for his liberation, and allowed himself to be persuaded to depose Bligh, assume the government, and appoint Macarthur colonial secretary.

While Johnston remained in command, Macarthur was practically the ruler of the colony, but Paterson when he took charge in January 1809 sent both Johnston and Macarthur to England for trial. After hearing both sides informally—and especially after receiving from Bligh a mass of letters written in a very bad temper, in which he made accusations against everybody he could think of—the British government was not anxious to put anyone on trial. Johnston insisted, and had to be cashiered; Macarthur remained untried, but was forbidden to return to Australia until he admitted wrong-doing and promised to behave himself. This he refused to do, and remained in exile until 1817, when Lord Camden thought him sufficiently punished and allowed him to return unconditionally. The rest of his life was spent mainly at Camden in the supervision and improvement of his live stock and estates. In 1822 the Society of Arts in London awarded him two medals, one for having exported to England 150,000 lb. of fine wool, the other for bringing his wool up to the standard of the best Saxon merino. In 1825 he was nominated to the New South Wales legislative council, of which he remained a member till his death on 10 April 1834.

In a letter to his wife written in 1809 Macarthur described his son John in words that might well be applied to himself:—

> . . . Under this softness I can discover an indescribable fierceness of independence and an obstinacy to pursue what he has once determined on, which neither reason nor dread of future consequence are likely to operate upon him to relax.

Few of his official superiors had a good word for him, and many of them thought him self-seeking, mutinous, and greedy. But among his equals he was often liked and always respected; what really angered the others was his 'indescribable fierceness of independence.' Strong and able—possibly the ablest man except Macquarie among the founders of Australia—he left among his contemporaries the impression of a hard and sometimes vindictive spirit; but his worst faults, whatever they may have been, are atoned for by his genius as a sheepbreeder and his gift of the merino sheep to his country. One among his virtues deserves special notice. In an age, and a community, notorious for its licentiousness, when it was considered proper to include a list of concubines in an official return, Macarthur's life was irreproachable and his affection for his family sincere, lasting, and noble.

See BLIGH, WILLIAM, JOHNSTON, GEORGE, SHEEP, and WOOL.

Macarthur, SIR WILLIAM (1800-1882), born at Parramatta in December 1800, in 1809 went to England with his father John Macarthur and his brother James, was educated at Grove Hall Academy, Bow, and returned with them to New South Wales in 1817. He devoted himself to farming, assisting his father in various projects, and in 1839 brought out six German vine-dressers to improve the Camden vineyards. In 1841 he gained medals in London for exhibits of wine and brandy, and in 1844 published a book *On the Culture of the Vine, Fermentation, and the Management of Wine in the Cellar.* He sat in the New South Wales legislative council from 1849 to 1855, when he was made New South Wales commissioner for the Paris exhibition; reaching England late in March, he found that no place had been reserved for the exhibits, but rectified the blunder, worked hard to display the Australian products, and at the close of the exhibition was decorated with the Legion of Honour by the French emperor. He returned to the colony in 1857 and resumed his work at Camden Park, repeated his Paris success at the London exhibition of 1862, and after his return to the colony in 1864 was nominated to the legislative council; but he cared little for politics—to which his brother and constant companion James was devoted—and his seat lapsed through absence in August 1882. He died unmarried on 29 October 1882. (Kt. Bach., 1856.)

Macartney, HUSSEY BURGH (1799-1894), son of Sir John Macartney, baronet, a member of the last Irish house of commons, was born at Dublin on 10 April 1799 and educated at Trinity College, Dublin (B.A., 1821; D.D., 1847). After taking his degree he entered the Irish Church (deacon, 1822; priest, 1823), and held cures in the dioceses of Meath, Ardagh, Ross and Kildare. In 1847 Bishop Perry of Melbourne invited him to take up work in Australia. He reached Port Phillip on 24 January 1848, and was appointed to the parish of Heidelberg; in November he became archdeacon of Geelong, in January 1852 was made dean of Melbourne and incumbent of St. James's church, and from January 1855 to April 1856 administered the diocese of Melbourne in Bishop Perry's absence. In 1857 he became archdeacon of Melbourne, and in 1860 gave up parish work and devoted himself entirely to the

diocese, which he again administered from January 1863 to September 1864, from February 1874 to January 1877 in the interregnum between the bishoprics of Dr. Perry and Dr. Moorhouse, and from March 1886 to March 1887 in that between Dr. Moorhouse and Dr. Goe. He represented his diocese in two general synods. In 1864-6 he visited England and Ireland. He died at Melbourne on 8 October 1894 (see MISSIONS).

McCallum, FRANK, better known as Captain Melville, was transported to Tasmania in 1838; in 1852 he took to bushranging on the roads leading from the Victorian goldfields to Melbourne, and by the end of the year had a price on his head for daring highway robberies. On 24 December he boasted in Geelong of his exploits, and the police chased and captured him. He was convicted of highway robbery, sentenced to 32 years' penal servitude, and confined on the hulk *President*. A year later he was removed to the *Success* (q.v.), where discipline was less harsh, and was permitted to work in the government stone-quarry at Point Gellibrand. On 22 October 1856 he and other convicts who were being conveyed to work suddenly overpowered the guard, killed the corporal, and pulled away in a boat, but were soon overtaken. McCallum was sentenced to death but reprieved. He was removed from the *Success* to the Melbourne gaol shortly before the murder of John Price (q.v.) on 26 March 1857, which he had possibly helped to plan. On 28 July he savagely attacked the governor of the gaol, and shortly afterwards became subject to paroxysms of fury such as precede dementia. He committed suicide in his cell on 11 August 1857. See BUSHRANGING.

MacCallum, SIR MUNGO WILLIAM, born at Glasgow in Scotland in 1854, and educated at the Glasgow high school and the university of Glasgow (B.A., 1875; M.A., 1877; LL.D., 1907), won the Luke fellowship at his university and afterwards studied at Berlin and Leipzig. In 1879 he was appointed professor of English literature and history in the university of Wales, and in 1887 became Challis professor of modern literature in the university of Sydney. This chair he held uninterruptedly until 1920; resigning then, he was nominated professor emeritus and—the chair having been divided into four when he left it—honorary professor of English literature. In 1898 1914 and 1916-19 he was dean of the faculty of arts and an ex-officio member of the senate: since 1919 he has been an elected member of that body. In 1924 he was made vice-chancellor under a new act of parliament which gave that name for the first time to the chief administrative officer of the university (previous vice-chancellors had been merely deputy-chairmen of the senate, appointed annually.) Professor MacCallum was in 1906-12 chairman of trustees of the public library of New South Wales, and is a member of the Commonwealth literary pensions board; in 1925 the university of Oxford made him an honorary D.Litt. Among his many published works the most notable are *Studies in Low German and High German Literature* (1883), *Tennyson and the Arthurian Legend* (1894), and *Shakespeare's Roman Plays and Their Background* (1910). (K.C.M.G., 1926.)

McCaughey, SIR SAMUEL (1835-1919), born at Tullynuey near Ballymena in county Antrim, Ireland, on 1 July 1835, migrated to Australia at the age of 20 and reached Melbourne in April 1856. After three months' experience as a 'jackeroo' on Kewell station in the Wimmera (which belonged to his uncle Charles Wilson), he was made manager of the station. In 1860 he with two partners bought Coonong station in the Narrandera district of New South Wales, and there he built up a remarkable stud flock; its foundation was a draft of Widgiewa ewes and one of rams from Mona Vale in Tasmania, owned by R. Q. Kermode (see SHEEP). In 1883 he bought ten Californian rams and some American ewes in Sydney, and was so satisfied with his purchase that he shortly afterwards visited the United States and brought back 524 stud sheep selected from the best strains in Vermont—spending in all about £50,000. He was among the first breeders to realize that sheep were to be valued for their mutton as well as for their wool; and side by side with the Coonong stud he established flocks of large-framed sheep from Wanganella, Boonooke, and South Australia. In 1880 he bought Toorale and Dunlop, two large stations on the Darling River south-west of Bourke, and in 1881 invested largely in Queensland stations. At one time he shore a million sheep every year.

He was an early and persistent advocate of irrigation for pastoral as well as for agricultural uses. In 1899 he bought North Yanco on the northern banks of the Murrumbidgee, and from a dam and pumping-station a few miles above the estate constructed many miles of channel to irrigate 40,000 acres, on part of which he grew lucerne and other fodder-crops, running stock on the remainder. The object lesson was so lucid that the New South Wales government arranged to establish on North Yanco an experimental farm, and in the end bought the station from McCaughey and constructed the gigantic Burrinjuck dam (see IRRIGATION) to impound water for the supply of a great irrigation settlement. By this time (1911) McCaughey, who had devoted himself almost vehemently to his work both as breeder and as irrigationist, was growing old; in 1911-12 he sold Toorale and Dunlop and his Queensland stations, and retained only Coonong, his original New South Wales home. This property he sold in June 1919 to Roy McCaughey, his nephew. From 1899 to 1919 he was a member of the New South Wales legislative council.

His benefactions were among the most generous ever known in Australia. He gave £5000 to aid the 'bushmen's contingent' in the South African war (q.v.), £10,000 to the 'Dreadnought' fund, and £25,000 to the Red Cross funds, besides insuring 500 recruits against death or total disablement. He also gave liberally to the Salvation Army and the Burnside Homes (see BURNS, SIR JAMES). Dying at Yanco homestead on 25 July 1919, he bequeathed over £300,000 to the university of Sydney, £250,000 to that of Queensland, £250,000 to the Presbyterian Church authorities in New South Wales and Queensland (including £20,000 to the Scots College in Sydney and £26,000 to the Burnside Homes), £10,000 each to four other Sydney schools, £5000 each to three Sydney hospitals, and £5000 to the Salvation Army. Perhaps his most valuable legacy was one devoted to the technical training of the children of deceased or totally disabled soldiers, under the administration of the A.I.F. Canteens Funds Trust. Fifteen thousand such children will benefit by this bequest, which will yield about £600,000. (Kt. Bach., 1905.)

M'Cay, Sir James Whiteside, born at Ballynure, Ireland, on 21 December 1864, one of a brilliant family well known in Australian journalism, was educated at Scotch College and the university of Melbourne (M.A., 1892; LL.M., 1895), and called to the Victorian bar in 1895. He entered the house of representatives as member for Corinella in 1901, and became minister for defence in the Reid government of 1904-5. He was a keen member of the militia (lieutenant, 1886; captain, 1889; major, 1896; lieutenant-colonel, 1905; colonel, 1907; brigadier-general, 1914; major-general, 1915), and at the outbreak of the war in 1914 General Bridges chose him to organize and command the 2nd (Victoria) infantry brigade. After putting it through a training remarkable for its severity and thoroughness at Mena Camp, he commanded it at the landing on Gallipoli, and personally led a portion in its famous advance on 8 May 1915 at the second battle of Krithia. Being wounded that night on the battlefield, he was invalided to Australia where he acted for a time as inspector-general, but after the evacuation of Gallipoli was appointed to command the 5th division then forming in Egypt. He trained this division and commanded it in the battle of Fromelles, for the unfortunate issue of which he was in no way responsible. Being noted for his thoroughness, he was in 1917 appointed to command the A.I.F. training depots in England, a position which he occupied until the end of the war. (C.B., 1915; K.C.M.G., 1918; K.B.E., 1919). See Australian Imperial Force.

C.E.W.B.

McCoy, Sir Frederick (1823-1899), born in Dublin in 1823 and educated there and at Cambridge, was diverted from the practice of medicine (for which he had been trained) by obtaining a commission to arrange collections of specimens for the Geological Society of Ireland and the Royal Irish Academy. He was next employed on certain palaeontological enquiries, and in 1846 was invited to Cambridge by Adam Sedgwick to arrange a collection in the university's Woodwardian Museum. During this engagement he was appointed in 1850 to the chair of mineralogy and geology at Queen's College, Belfast, and carried on his two tasks side by side until 1854, when his Cambridge work was completed, and he was able to embody its results in *British Palaeozoic Rocks and Fossils.* In that year he was made professor of natural science in the newly established university of Melbourne, and found himself expected to control the study of geology, zoology, palaeontology, botany, mineralogy, chemistry, and even comparative anatomy; of these subjects he chose the first four for his own, and handed on the others as soon as possible to other teachers. During his tenure of the chair he published a *Prodromus of the Palaeontology of Victoria* (1874-82) and a *Prodromus of the Zoology of Victoria* (1885-90), but his most important contribution to the progress of the colony was the establishment and building up of the National Museum. This, when he took charge of it, was merely a collection of stuffed animals housed in the crown lands office; McCoy removed it (in spite of protests from the Philosophical Society) to the university, and managed it till his death, defying or evading all attempts to put it under the control of trustees. His other scientific activities were manifold, but of less importance. Cambridge in 1886 made him a D.Sc., the Geological Society of London awarded him the Murchison medal (1879), the Royal Society made him a fellow (1880), and he received other honours from Italy and Austria. He died at Brighton Beach near Melbourne on 13 May 1899. (C.M.G., 1886; K.C.M.G., 1891.)

McCrae, George Gordon, born at Leith in Scotland on 29 May 1833, is the son of Andrew Murison McCrae, writer to the signet, who in 1839 at the suggestion of his friend Sir T. L. Mitchell migrated to Sydney, but settled almost at once in the new township of Melbourne. The family reached Melbourne on 1 March 1841, and Andrew McCrae took up land for a cattle-run near Arthur's Seat. After a short experience of commercial and banking work, G. G. McCrae on 1 January 1854 entered the office of the Victorian auditor-general, and after promotions through several government departments reached the position of deputy registrar-general, from which he retired, having reached the statutory age-limit, in 1893. He has since lived in retirement at Hawthorn, a suburb of Melbourne. McCrae's chief service to his country, however, has been rendered outside his official life. Joining during the sixties the coterie of literary men—R. H. Horne, Marcus Clarke—who founded the Yorick Club, made the reputation of the *Colonial Monthly,* and attracted into their circle both Adam Lindsay Gordon and Henry Kendall, he began to devote his leisure to authorship, and in 1867 produced two ballads of aboriginal life—*The Story of Balladeadro* and *Mamba the Bright-eyed.* In 1873 he published *The Man in the Iron Mask,* which some critics consider his masterpiece, others preferring the later *Rosebud from the Garden of the Taj* (1883), which was published only in the *Melbourne Review.* Though his verses are widely scattered through many Australian periodicals, the only other volume of verse yet published is *The Fleet and Convoy* (1915). A novel, *John Rous,* appeared in 1918: but other novels, besides dramas, poems, and the third of his ballads of the aborigines (*Karakorok*), are still unpublished.—His second son, Hugh Raymond McCrae, born at Hawthorn in 1876, is notable among the younger school of Australian poets; his published volumes are *Satyrs and Sunlight* (1909), *Colombine* (1920), and *Idyllia* (1922), and (in prose) *The Du Poissey Anecdotes* (1922).

McCron, Francis (1810-1853), better known by his stage-name Francis Nesbitt, was born in Ireland in 1810 and against his family's wishes adopted the stage as a profession, becoming a member of a travelling company in which he met G. V. Brooke and Barry Sullivan; during a visit to Glasgow he also met Gordon Griffiths, who was subsequently engaged to perform at the Victoria theatre in Pitt-street, Sydney. In 1840 he returned to Ireland, married, and migrated to Sydney, which he reached on 7 January 1841 in the *Marchioness of Bute.* His letters of introduction (one to Governor Gipps was not delivered) procured him the post of tide-waiter in the customs, but he quarrelled with a superior officer, and after one night's experience of police duty applied for work at the Victoria theatre. He was engaged to appear as Pizarre, became popular, and revived the falling fortunes of the theatre; when the owner opened the City theatre in Market-street on 20 May 1843, Nesbitt spoke the opening address, which had been written by William a'Beckett (q.v.). During the next few years he played in Launceston, Hobart, Melbourne, and Adelaide, but in 1846-7 reappeared at the Vic-

toria theatre, and towards the end of 1847 retired to Maitland, where he supervised an amateur company. In 1849 the Californian gold-rush attracted him to San Francisco; there he played at the Kearney-street theatre under his own name, McCron, but quarrelled with the local actors, and was forced to leave the stage and seek the diggings. It is said that on his way back from them, having had no luck, he was 'stuck up' by a gang one of whose members was an Australian; appealing to this man, and satisfying him by a recitation of Tell's address to his native mountains (from a translation of Schiller's 'William Tell') that he really was Nesbitt, he was released, nursed back by the gang to health and good spirits, and sent back to the coast with means to return to Sydney. He did not, however, renew his former successes; he made appearances at Sydney, Melbourne, and Geelong, and collapsed during a performance at the Geelong theatre, dying next day—29 March 1853. G. V. Brooke afterwards erected a headstone over his grave in the Geelong cemetery. See DRAMA.

McCubbin, FREDERICK (1855-1917), born at Melbourne on 25 February 1855, studied art at the artisans' school of design and the national art school, where he with Tom Roberts and C. D. Richardson formed the first life-class. In 1884 he was appointed drawing-master at the national art school, and in 1891 temporarily directed it. In 1885 he and Tom Roberts established the first of the famous artists' camps at Box Hill, near Melbourne, and he was thrice president of the Victorian Artists' Society (1903-4, 1908-9, 1911-12). In 1912 he helped to initiate the Australian Art Association. As far back as 1897 he exhibited at the Old Salon in Paris, and later at the Grafton galleries in London, but visited Europe for the first time in 1907. He died at Melbourne on 22 December 1917.

McCubbin was a student in the days when the copying of studio pictures was the normal method of art instruction and even inspiration, and he never quite lost the habit of producing arranged and 'composed' work. But his natural instincts were for open-air painting and the straightforward delineation of sincere human interest. In a series of notable pictures which included 'Down on his Luck,' 'A Bush Burial' (at Geelong), 'On the Wallaby' (in the Sydney gallery), and 'Pioneers' (in the Melbourne gallery), he depicted the pathetic side of the early settlers' life. In later years he was content to paint pure landscape. As a portrait-painter he was unequal, his best work in this kind being portraits of J. A. Panton, Louis Abrahams, and Alfred Deakin. W.M.

McCulloch, ALLAN RIVINGSTONE (1885-1925), born at Cabarita near Sydney on 20 June 1885, obtained employment at the Australian Museum in July 1898, and worked there for three years as a volunteer before becoming a permanent member of the staff. Early in 1906 he was placed in charge of the vertebrate section of zoology, and began to concentrate his attention on the study of fishes. The carelessness (or incapacity) of several early workers in Australian ichthyology had left that science in an unsatisfactory condition, and McCulloch determined to place it on a sound basis; by dint of industry and perseverance, combined with natural aptitude and an intense love of his subject, he attained his object, and in 1922 published a *Check List of the Fishes of New South Wales* which is both brilliant in conception and fundamentally sound. His many papers on ichthyology contributed to scientific journals are noted for their accuracy and draughtsmanship. He was already ranked among leading ichthyologists when, exhausted by incessant work, he died at Honolulu on 1 September 1925, while attending the second Pan-Pacific Food Conservation Conference. T.C.R.

McCulloch, SIR JAMES (1819-1893), born at Glasgow in 1819 and trained for mercantile pursuits, while still young entered the employ of Messrs. J. and A. Dennistoun, and in 1853 was sent as a junior partner to Melbourne to open a branch of the firm there. In 1854 he was nominated to the old council, and when a new legislature was elected under the system of responsible government in 1856 he was returned to the assembly by the Wimmera. In 1857 he was commissioned by Barkly to form a ministry, but finding himself unable to procure a coalition took office as commissioner of customs under W. C. Haines (1857-8). He was afterwards treasurer under W. Nicholson (1859-60). When in 1863 the third O'Shanassy ministry resigned office, Barkly again appealed to McCulloch, who formed what was by far the strongest cabinet the colony had seen or was to see for many years; it included Higinbotham, Michie, Verdon, Heales, and Francis, held office continuously for 5 years (27 June 1863 to 6 May 1868), after a short interval regained it for another 14 months (11 July 1868 to 20 September 1869), and after a rather longer interval returned to office for a similar period (9 April 1870 to 19 June 1871). McCulloch's term of office was notable for several violent political episodes, particularly in connection with the establishment of a protective tariff and with the 'Darling grant.' The struggle over the tariff was much embittered by McCulloch's methods of passing it. Backed by the assembly, but confident that the council would reject any separate bill for a protective tariff, he 'tacked' his new scale of duties on to the ordinary appropriation bill for 1865; the council, debarred by the constitution from amending a money bill by the omission of individual clauses, laid the bill aside; McCulloch went on collecting the new duties despite a judgment of the supreme court ordering him to refund them, and with the aid of Sir C. Darling devised a legal but high-handed method of paying official salaries and other public obligations without the sanction of an appropriation act. At the end of 1865 a general election, amid intense excitement, gave him an increased majority, and during 1866 a compromise was effected, McCulloch dropping the 'tack' and the council passing the tariff in a separate bill. By this time, however, the British government had interfered. Darling was their officer, and in their opinion should have refused to allow the collection of duties as soon as the supreme court had ordered restitution, while his acquiescence in the trick by which salaries, etc., had been paid was even more blameworthy. This censure became known; McCulloch's friends organized demonstrations of sympathy with the governor; Darling, always weak and now overexcited, betrayed his resentment of the censure and proceeded to attack personally several local politicians who had opposed him; his recall was thus made inevitable. The assembly, guided by McCulloch, promptly voted him an address in which he was praised as a peacemaker and told that he had steadfastly adhered to the principles

of constitutional government, and emphasized its opinions by voting a grant of £20,000 to Lady Darling to compensate her husband for the pecuniary loss caused by his recall. The sequel is told under DARLING, SIR CHARLES; it may be said here that McCulloch's loss of office in May-July 1868 was due to a quarrel with the British authorities over this grant, and that by July Darling had made his peace with those authorities and the grant was no longer required.

McCulloch's ministry of 1870-1, though it carried the abolition of state aid to religion, was far less advanced in views than his earlier ministry, and he himself was slowly growing conservative. He had never been a convinced protectionist, and could not accept the demands for increased protection that Graham Berry and his followers were incessantly pressing on him. Further, he had lost Higinbotham, whose support had always assisted his popularity. In June 1871 Duffy and Berry ousted him, and in August 1872 he retired to the agent-generalship. In 1875, however, he returned to Victoria and to Parliament as a supporter of Berry, but when Berry took office with a policy of land-taxation, he turned him out and formed another ministry (20 October 1875 to 21 May 1877), chiefly notable for its introduction of the closure as a piece of parliamentary machinery. By now, however, he was identified with the squatter party, and the elections of 1877 finally ejected him from politics. In 1885 he left Australia, and died at Ewell in Surrey on 31 January 1893. (Kt. Bach., 1869; K.C.M.G., 1874.)

MacDonnell, SIR RICHARD GRAVES (1814-1881), son of the Richard MacDonnell who was late in life provost of Trinity College, Dublin, was born in Dublin on 3 September 1814, educated at Trinity College (B.A., 1835; M.A., 1836; LL.B., 1845; LL.D., 1862), called to the Irish bar in 1838 and to the English in 1841, and in 1843 made chief justice of the Gambia colony, of which in 1847 he became governor. In 1852 he was transferred to St. Lucia, and the next year to St. Vincent. During these periods of office he had won the reputation of being a courageous explorer and a good organizer, but one inclined (as is necessary in mainly negro colonies) to exercise an autocracy which English settlers would resent. The choice of him by the colonial office to succeed Sir Henry Young (q.v.) in South Australia at the very moment when important constitutional changes were being made—and those in the direction of fuller self-government—was therefore unexpected. Reaching Adelaide on 8 June 1855, he dissolved the legislative council and promulgated his own scheme for a new single-chamber constitution. This scheme had to be withdrawn almost immediately in favour of a copy of the Tasmanian constitution, that again being much amended and liberalized before it was enacted and brought into force. Throughout the long struggle MacDonnell's influence was persistently conservative, and his reserved and often dictatorial attitude towards his ministers caused unnecessary friction, for which his great abilities did not compensate; one result was to make the South Australian constitution more democratic than it would have been, and far more so than that of any other colony at the time. When, however, it was promulgated, and the governor's powers were no longer those suitable in a crown colony, MacDonnell adjusted himself to the new conditions quickly and thoroughly, and became both popular and useful. Among the important events that occurred during his term of office were the passing of the Torrens act (q.v.), the construction of railways from Adelaide to the Burra, most of the explorations of J. McDouall Stuart, and the annexation of the 'no man's land' between longitude 132° E. and the border of Western Australia. On 4 March 1862 MacDonnell retired, his term being at an end; after a holiday, he was appointed governor of Nova Scotia (1864-5) and subsequently of Hong Kong (1865-72). He then retired from the colonial service on a pension and died at Hyères in France on 5 February 1881. (C.B., 1852; Kt. Bach., 1855; K.C.M.G., 1872.)

McEncroe, JOHN (1795-1868), born near Cashel in Ireland on 26 December 1795, educated at Maynooth, and ordained priest in 1819, taught for a short time at the Meath diocesan seminary and was then transferred to the diocese of Charleston in the United States, where for seven years he acted as vicar general to Bishop England. His health then gave way, and he returned to Ireland; not long afterwards he was offered an American bishopric, but preferred to join the Australian mission, to which J. H. Plunkett (q.v.) procured his official appointment as an additional chaplain. In 1832, before he left Ireland, Plunkett described him as 'a very respectable Clergyman, prudent in the discharge of his duties in this Country, and never mixing himself with any of its political parties.' Reaching Sydney on 17 June 1832 he at once won the affection of Father Therry, and worked harmoniously with him, but (having had wider experience of diocesan work) saw that the provisional attachment of the Australian mission to the diocese of the Mauritius was unworkable. From the first, therefore, he sent to Rome strong recommendations that a bishopric should be established in Australia, and the credit of obtaining one is largely his. From 1839 to 1841 he was stationed at Norfolk Island, where he erected the first Catholic chapel. Apart from his regular duties —which were carried on until his death with a broad-mindedness and level-headedness that greatly enhanced their value—he is specially noted as the founder of the *Freeman's Journal* in 1850. When in 1854 Dr. Davis, the coadjutor-archbishop of Sydney, died during the absence of Archbishop Polding in Rome, it was Father McEncroe whom the local clergy unanimously chose to administer the diocese. Though vigorously opposed to Archbishop Polding's choice of priests for the Sydney mission, he was, after Ullathorne's departure, the archbishop's confidential adviser in every forward movement, and the reorganization of the Catholic schools after Parkes's first education act was largely his work. Dr. Polding made him dean of the cathedral and, later, archdeacon of the diocese, and in the latter capacity he visited Rome and Ireland in 1858-9 and selected Dr. Forrest of Maynooth to be first rector of St. John's College within the university of Sydney.

His interest at this time, an interest which he did not attempt to conceal, was to bring out Irish priests to minister to the Catholics of Sydney, who were chiefly of Irish descent. Failing to secure a change in the archbishop's policy, he advocated the formation of new suffragan sees, from which the Benedictine influence would be kept out. For this policy, in the circumstances of the colony, there is a good deal to be said, and McEncroe's motives were completely apostolic. His last mission was that of St. Patrick's on Church Hill, Sydney, where he

worked until his death on 22 August 1868. A short, inadequate biography was published in 1868 by J. G. O'Connor of Sydney. E.M.O'B.

MacGillivray, JOHN (1822-1867), son of the eminent Scottish naturalist William MacGillivray, born at Aberdeen on 18 December 1822, studied medicine at Edinburgh, but before completing his course was in 1842 appointed assistant-naturalist to Professor Jukes in H.M.S. *Fly*, then under orders to survey Torres Straits, southern New Guinea, and the eastern coast of Australia. Returning to England in 1846, he obtained a similar appointment in H.M.S. *Rattlesnake* under Owen Stanley, with T. H. Huxley as a fellow-worker. Of this voyage (which ended in 1850) he wrote a *Narrative of the Voyage of H.M.S. Rattlesnake*, (London, 1852). Late in the same year he joined H.M.S. *Herald* as naturalist, with a view to surveying western South America and the neighbouring islands; but in 1855 he left the ship at Sydney, joined a party of sandalwood traders, spent five years in the South Sea islands, and made numerous and valuable collections, especially of island plant. He died at Sydney on 6 June 1867, and his herbarium was sent to Sir W. J. Hooker to be preserved at Kew Gardens near London.

McGowen, JAMES SINCLAIR TAYLOR (1855-1922), was born at sea on 16 August 1855, and three weeks later was taken ashore at Melbourne. In 1870 he was apprenticed to boiler-making, and in 1875 entered the service of the New South Wales railways. Becoming prominent in his trade union, he was in July 1891 returned by Redfern (the Sydney suburb in which the railway workshops are situated) to the legislative assembly, and represented the constituency without a break until 1917; losing his seat in February of that year, he was in May appointed to the legislative council, and was a member of that body till his death. In 1894 he was chosen leader of the Labour party in the New South Wales parliament, and after many strenuous years became on 21 October 1910 the first Labour premier and treasurer of his State. He was early in 1911 summoned to London to represent the State at the coronation of King George V, and during his absence the party leadership fell into the hands of a more active subordinate, so that on McGowen's return he was induced to surrender all real power and content himself with less important offices. On 30 June 1913 he was replaced in the premiership by William Arthur Holman, under whom he served for seven months as minister for labour; he then left office, and remained a private member until in 1917 he was defeated at the polls because he favoured conscription during the war—a policy to which the Labour party in 1916 and onwards was bitterly opposed. For a time he was chairman of the housing board in connection with repatriation (q.v.), and in 1921-2 was a state censor of cinematograph films. In youth he was an ardent cricketer and active in establishing the system of electoral cricket; he was also a pioneer of the eight-hour movement. He died at Petersham, a suburb of Sydney, on 7 April 1922.

McGregor, GREGOR (1848-1914), born at Kilmun in Scotland on 18 October 1848, and educated privately, in 1867 obtained employment in the Clyde shipbuilding yards, but in 1876 migrated to South Australia and took up farming. After 11 months of this work he met with an accident which made him practically blind for the rest of his life; finding it difficult to obtain permanent employment, he was from 1885 to 1891 a builder's labourer in Victoria. In 1891 he returned to South Australia and became an active member of the local Labour party, being elected in May 1894 by the Southern District to the legislative council as a Labour representative. In March 1901 he left state politics to enter the federal senate as one of the six South Australians, and retained this position until his death, leading the Labour section of the senate during the whole period. In each of the three Labour ministries (Watson, 1904; Fisher, 1908-9; Fisher, 1910-13) he was vice-president of the executive council, and in the parliament of 1913-4 led the opposition in the senate. He was one of the most temperate and most widely trusted of Labour leaders, and his death on 13 August 1914, while standing for re-election, was regretted by friends and opponents alike.

MacGregor, SIR WILLIAM (1846-1919), born on 21 October 1846 at Towie in Aberdeenshire, was the eldest son of John MacGregor, a farm-labourer. He received part of his early education at the Strathdon manse, and afterwards taught in a small school at Tillyduke. In 1865-7 he attended the Aberdeen grammar school, in 1867 entered King's College, Aberdeen, and took an arts course, but soon afterwards changed his intentions and studied medicine, first at Glasgow and then at Aberdeen (M.B. and C.M., 1872; Watson gold medal; L.R.C.P. Edin., 1872; M.D., 1874; hon. D.Sc. Camb., hon. D.Sc. Q'ld.). He also studied at Berlin, Florence, and Paris. In 1872 he was for a time resident medical officer at the Glasgow royal infirmary and at the Aberdeen lunatic asylum; but chest weakness compelled him to migrate to the Seychelles, where in 1873 he became assistant medical officer; in 1874 he was appointed surgeon of the Port Louis civil hospital in the Mauritius. From 1875-88 he was chief medical officer in Fiji, at times also acting as receiver-general, commissioner for lands, colonial secretary, and auditor, and on several occasions as high commissioner and consul-general for the western Pacific. In 1876 he suppressed a disturbance in the mountains of Viti Levu, and in 1877 was appointed a member of the native regulation board. In 1879 he reported on the financial condition of Tonga. In 1886, as colonial secretary to the Fiji commission, he sat at the first federal council of Australasia; here he made a great impression on Sir Samuel Griffith, who was instrumental in having him appointed administrator of British New Guinea in 1888 (lieutenant-governor, 1895). In 1899 he was made governor of Lagos, where he opened up large tracts of country with roads and railways, and during his term represented the West African colonies and protectorates at the coronation of King Edward VII. In 1904 he was transferred to Newfoundland, where he endeavoured to stamp out tuberculosis, which was then overrunning the island.

On 2 December 1909 he became governor of Queensland, retiring in July 1914. In April 1911 he was elected first chancellor of the university of Queensland, which came into being largely through his efforts. During the war his great knowledge of Pacific affairs was utilized by the colonial office in considering the future of that part of the world. On 3 July 1919 he died at Aberdeen.

MacGregor was a man of many parts, sincere, discriminating, and courageous. In Papua his best work (by his own judgment) was (*a*) the

establishment of a native police-force and a system of village constables and (*b*) the allotment of specified districts to the various missions, to prevent overlapping. The use of natives in government service originated with him: at his arrival not a single native was so used, but when he retired 20 per cent of the administrative expenditure went in pay for native services. His land regulations and those forbidding the issue of liquor and opium to natives helped materially to lay the foundations of Australian policy in Papua. He was awarded the founder's medal of the Royal Geographical Society for his explorations in the interior of New Guinea, and the Mary Kingsley gold medal 1910 for his labours in combating malarial fever in Lagos. In 1897 he published *British New Guinea, Country and People*, and his ten annual reports on British New Guinea are of the greatest value both to anthropologists and to philologists. (C.M.G., 1881; K.C.M.G., 1889; C.B., 1897; G.C.M.G., 1907; P.C., 1914.) L.A.

McIlwraith, SIR THOMAS (1835-1900), born at Ayr in Scotland on 17 May 1835 and educated at Ayr academy and the university of Glasgow, was trained to engineering and in 1854 migrated to Victoria and joined the engineering staff of the Victorian railways. In 1861 he dropped his profession to become a squatter in Queensland, and in October 1868 was sent to the legislative assembly by Maranoa. In 1874 he was for nine months minister for works and mines under Arthur Macalister (during two of those months he had his great rival Samuel Griffith as a colleague) but then abandoned politics for a few years. In 1878 he was returned for Mulgrave, challenged and defeated the Douglas ministry as soon as parliament met, and on 21 January 1879 formed his first ministry and entered on his long contest with Griffith. The outstanding episode of this term of office was his annexation of Papua (q.v.) which the British government disowned, thereby losing to Germany all the north-eastern coast of the island. In the same masterful spirit McIlwraith ratified over the head of parliament a contract for a direct mail-service between London and Brisbane via Torres Straits; but his attempt in 1883 to force assent to a railway on the land-grant principle from Charleville to the Gulf of Carpentaria was defeated, and he was ousted from office by Griffith. In 1888 he had his revenge, headed the poll for Griffith's constituency of North Brisbane, and formed his second ministry, which lasted only five months owing to a dispute with Governor Musgrave. Benjamin Kitt had been sentenced to three years' imprisonment for stealing two pairs of boots. McIlwraith and his cabinet wanted to release the man on probation; Musgrave refused, and, when the matter was pressed, insisted that it was one to be decided by the governor alone, offering at the same time to refer the whole question to the colonial office. McIlwraith persisted in his contention, and resigned office; the ministry was reconstructed under Boyd Morehead (q.v.), McIlwraith representing it in the legislative council without portfolio. In the end the colonial office decided (*a*) that a governor was bound to obtain the advice of his ministers before taking any action, (*b*) that, having received the advice, he might follow it or not as he thought fit, (*c*) that in this particular case Musgrave was within his rights, but 'would have exercised a sounder judgment if he had subordinated his personal opinion to the advice of his ministers.' In 1889 McIlwraith left Morehead on a minor question of finance (the amount of money to be spent on the Brisbane railway-station), and in August 1890 joined his old opponent Griffith in a coalition ministry which lasted until 1893 (McIlwraith taking the premiership when Griffith became chief justice), and was reconstructed as the Nelson ministry of 1893-8. In this McIlwraith was chief secretary and minister for railways, but failing health compelled him to retire in 1895. He refused the agent-generalship, settled in England, and died there on 17 July 1900.

McIlwraith's personality was his great asset; he was a big man with a 'bulldog' head, who always knew his own mind and could express his opinions forcibly and defend them doggedly. Moreover, he scorned details and minor issues, and was unhappy unless he had some unusual or grandiose policy to advocate. Such a man is fated, as McIlwraith was, to lead a party triumphantly until the last moment but one, when his followers suddenly discover themselves almost committed to schemes beyond the grasp of their imagination, and abandon the leader pell-mell. In a federated commonwealth he might have become the Cecil Rhodes of Australia. (K.C.M.G., 1882.)

McInnes, WILLIAM BECKWITH, born at Ringwood in Victoria in 1889, at the age of 14 entered the art school attached to the Melbourne gallery, and studied there under F. McCubbin and Bernard Hall until 1911. In 1912 he visited Europe to study and practise his art, extending his travels from the Hebrides in the north to the coast of Morocco in the south. Returning to Australia, he soon became known as a landscape painter, but gradually devoted the major part of his time to portraits, and in 1918 was made drawing-master at the art school where he had studied as a boy. He won the Archibald prize (see ARCHIBALD, JULES) for portraiture in 1921 and the three following years, and is represented in the Sydney, Melbourne, Brisbane, and Castlemaine galleries. W.M.

McKaeg, JOHN, of whose earlier years nothing is known, reached Sydney in 1831 and gathered a congregation of Baptist worshippers in a room rented for the purpose in King-street. This room being found too small, in 1832 he took a room in Hart's buildings in Pitt-street, and soon raised funds for building a church. In September 1832 McKaeg, accompanied by Ralph Mansfield (q.v.), Samuel Terry and Thomas Lawton, obtained from Bourke (then governor) a grant of the site in Bathurst-street on which the Baptist church now stands. Building materials were purchased, but the erection was delayed, and in 1834 McKaeg resigned his post. See BAPTISTS. J.C.

McKay, HUGH VICTOR (1865-1926), was born at Raywood, Victoria, on 21 August 1865, and educated at Drummarton state school. His early years were spent in farming on his father's property; at 18, having a special aptitude for agricultural work, he assumed full control of the farm. In 1884 he invented a harvesting machine which was an improvement on one devised by John Ridley (q.v.) in that it combined winnowing with stripping. This crude implement of McKay's, made from parts of other farm implements and a number of kerosene tins, aroused no enthusiasm, but he persevered, touring Victoria on a bicycle in the endeavour to overcome the conservatism of the 'men on the

land.' Eventually, in 1888, he was able to build a factory at Ballarat, and gradually overcame the indifference of the farmers and the opposition of other implement makers; his output increased, and the merit of his machine became acknowledged both at home and abroad. In 1906 he transferred his plant from Ballarat to Sunshine, near Melbourne, and during the next two decades the Sunshine Harvester Works grew to their present dimensions. There McKay had the satisfaction of seeing a wilderness slowly transformed into a model township with more than 4000 inhabitants, and the factory develop into workshops covering 35 acres. Over 2000 hands are employed, wages and salaries paid exceed £600,000 per annum, and the materials used are almost wholly of Australian production. Since labour and other conditions in Australia differ from those in older countries, McKay invented implements more suitable for the Australian farmer, so that, single-handed, he can do work that would elsewhere require assistance.

During the war he was a member of the Board of Business Administration associated with the defence department, and the Sunshine works were utilized for the manufacture of munitions; in 1918 he received the C.B.E. in recognition of his services to war industries. A charitable trust which he established for the improvement of conditions of life in the inland districts of Australia has an income of about £10,000 and is administered by three trustees. He died at Rupertswood, Victoria, on 21 May 1926. (C.B.E., 1918.)

Mackellar, Sir Charles Kinnaird (1844-1926), born at Sydney on 5 December 1844 and educated at the Sydney Grammar School, at first adopted a pastoral career, but in 1866 studied medicine at the university of Glasgow (M.B., C.M., 1871). Returning to New South Wales, he practised his profession until in 1882 he was appointed medical adviser to the government and first president of the board of health, which he organized. In August 1885 he was nominated to the legislative council, and in 1886-7 represented the Jennings ministry there as vice-president (February-December 1886) and minister for mines (December 1886-January 1887). In October 1903 he resigned his seat in the council and was elected by the New South Wales parliament to fill a vacancy in the Commonwealth senate caused by the resignation of R. E. O'Connor (q.v.); this appointment, however, lasted only to the end of November, when the federal parliament was dissolved, and Mackellar was renominated to the New South Wales council. In 1901 he sat on a commission that investigated the needs of neglected and delinquent children, and from that time onwards devoted himself to improving the methods by which the State dealt with them. From 1902 to 1914 he was president of the state children's relief board. He died at Woollahra, Sydney on 14 July 1926. (Kt. Bach., 1912; K.C.M.G., 1916.)

His daughter Isobel Marion Dorothea Mackellar, born at Sydney, has written three books of verse, *The Closed Door* (1911), *The Witch-maid* (1914), and *Dream-harbour* (1923), and three novels, *The Little Blue Devil* (with Ruth Bedford, 1912), *Outlaw's Luck* (1913), and *Two's Company* (with Ruth Bedford, 1914). When at her best Miss Mackellar must rank in the front line of Australian poets. She has feeling, fancy, a simple and frank choice of the fittest epithets, and a commendable directness of observation. Her 'My Country,' a simple and sincere patriotic poem, is known wherever there are Australians.

Mackennal, Sir Bertram, born in Melbourne on 12 June 1863, from an early age studied sculpture under his father and at the school attached to the Melbourne gallery. On the advice of an English sculptor, Marshall Wood, he migrated in 1882 to London and set up a studio with Charles Richardson, an Australian artist. For a time he studied at the art school of the Royal Academy; but in 1885 went to Paris; in 1886 returned to England to take charge of the art department of some potteries at Coalport in Shropshire. In 1887 he was commissioned to design and carve the panels on the front façade of the Victorian houses of parliament. After completing this and a few other commissions he went back to Paris in 1891, settled there, and in 1893 exhibited at the Salon the original model of the 'Circe' now in the Melbourne gallery; for this he was awarded a *mention honorable.* In 1894 he crossed to London and showed the 'Circe' at the Royal Academy. In 1901 and 1926 he revisited Australia.

Since 1894 he has exhibited regularly at the Academy, of which he was made an associate in 1909—the first Australian to be admitted—and a full member in 1922. The Chantrey bequest has placed in the Tate gallery 'Diana Wounded' and 'Earth and the Elements.' A South African war memorial by him is at Islington; Queen Victoria memorials at Lahore, Blackburn in Lancashire, and Ballarat; equestrian statues of King Edward VII in London and Calcutta; a memorial tomb of King Edward and Queen Alexandra in St. George's chapel at Windsor; and several statues of King George V at Delhi. His memorials of the war of 1914-18 stand (or will stand) in St. Stephen's hall at Westminster, in the playing-fields at Eton, and on the St. Kilda-road at Melbourne. 'The Horses of the Sun' are over the doorway of Australia House in London. His portrait statues or busts include those of Dame Nellie Melba, Sarah Bernhardt, and Marie Tempest. In Australia, besides the sculptures already mentioned, he is represented by a figure, 'Oceana,' in the Union Club at Sydney, a 'temple tomb' in Kew cemetery near Melbourne, a colossal head, 'War,' in front of the federal parliament-house at Melbourne (to be removed to Canberra when that town becomes the Commonwealth's capital), and a Shakespeare memorial in front of the Mitchell Library at Sydney. (M.V.O., 1912; K.C.V.O., 1921.)

Mackenzie, Sir Robert Ramsay (1811-1873), born at Coul in Ross-shire, Scotland, on 21 July 1811, in 1826 migrated to New South Wales and settled at Riddlesdale near Dungog. In 1837 he took over from E. G. Cory, his neighbour on the Williams, two New England stations between Walcha and Uralla, and a little later occupied land beyond Glen Innes; but his preference for city life, which left the stations to managers, led to heavy financial losses in 1844. In 1846 he made a rich marriage, transferred his activities to the Brisbane River valley, and became a wealthy squatter. In December 1859 Sir George Bowen picked him to be first colonial treasurer of Queensland (in the Herbert ministry), but after three years he resigned, objecting to Bowen's land policy and being too cautious to approve of his big-loan policy. In 1860 he was made chairman of the first board of education,

but in 1861 was rebuked by parliament for refusing to subsidize denominational schools, resigned the chairmanship at once to Macalister, and in 1862 left the board altogether. In February 1866 he rejoined the ministry—which was being re-formed under Arthur Macalister—as colonial secretary, but retired again when in July Herbert regained office for three weeks. He spent the next year in fighting Macalister, whom in August 1867 he ousted from the premiership; he then formed a ministry which passed the act adopting Sir J. Cockle's (q.v.) consolidation of the laws of Queensland. He also attained fame by postponing the deliverance of a ministerial statement because an eclipse of the sun was due. Defeated by Charles Lilley in November 1868, he within a month succeeded his brother in the baronetcy of Mackenzie of Coul. In 1871 he returned to Scotland, and died there on 19 September 1873.

Mackerels, fishes of the family Scombridae; several kinds occur in Australian waters, but the best known is *Scomber australasicus,* which is common on all the coasts south of the tropics. It is a small fish, rarely exceeding 14 inches in length, and sometimes moves along the coasts in great shoals, pursued by larger fishes and dolphins. In endeavouring to escape from its enemies, it swarms into inlets and harbours, where it is captured by line fishermen. Though apt to decay rapidly (especially if the flesh be not well bled), a fresh mackerel is not to be despised as a food-fish. The Australian species is very closely allied to the Chub Mackerel, Spanish Mackerel, or Thimble-eyed Mackerel (*Scomber colias*) of European and American seas. Another species, *Rastrelliger kanagurta,* is widely distributed in the Indian and Pacific oceans, and has been recorded from tropical parts of Australia.

Fishes of the genus *Scomberomorus,* called in Australia 'Spanish mackerel,' are esteemed both as game and food-fish, attaining a length of about six feet. They are compressed and slender in form, and beautifully marked with dark bars and spots on a silver ground. In Queensland, where they are commonly called 'kingfish,' they are captured with a large hook concealed in a bright-coloured rag and trailed behind a boat on a strong line. They are also eagerly sought by rod-fishermen, who use fine lines and troll behind a launch a garfish beset with many small hooks. Three or four distinct species of Spanish mackerel are known from the Australian coasts, all inhabitants of open tropical waters, though some periodically extend southward as far as Sydney.

The Frigate Mackerel (*Auxis thazard*) and the Horse Mackerel (*Sarda chiliensis*) are other members of the group, and range over the open oceans. They have torpedo-shaped bodies and large forked tails, which enable them to travel through the water with great speed. They occasionally appear in schools along the coasts, but little is known of their habits in Australia.

A.R.McC.

McKinlay, JOHN (1819-1872), born at Sandbank on the Clyde in 1819, came to New South Wales in 1836 to join his uncle on a sheep-station, and ten years later settled at Ki on the Murray in South Australia. Here he began to explore the unoccupied country lying between the Darling and Lake Torrens, and later took up several runs in that area; he also induced the colonial government to recognize the Murray River as an important highway of trade. In 1861, when anxiety was felt as to the fate of Burke and Wills, he was chosen by the government to lead the search party which left Adelaide on 16 August (see EXPLORATION BY LAND). He discovered traces of Burke and Wills, and found the remains of Gray. On his return 13 months later the South Australian parliament made him a grant of £1000, and in May 1863 the Royal Geographical Society of England presented him with a gold watch. In 1865, B. T. Finniss (q.v.) having failed to convince the South Australian government that Escape Cliffs on Adam Bay was a suitable site for the capital of the Northern Territory, McKinlay was sent to investigate the area between the Adelaide, Liverpool, and Roper rivers in the hope of finding an inland site for the capital. Unfortunately he did not reach Adam Bay until 5 November, had to traverse swampy country in an exceptionally wet season, and with difficulty reached the East Alligator River, from the mouth of which he returned to Adam Bay on a raft covered with the skins of his horses and provisioned with their flesh. Disheartened by this failure, he returned to South Australia, settled on a farm near Gawler, and died there on 31 December 1872.

J.V.C.-B.

Maclagan, E. G. S. See SINCLAIR-MACLAGAN, E. G.

MacLaurin, CHARLES (1872-1925), son of Sir H. N. MacLaurin (q.v.) was born in Sydney on 22 November 1872 and educated at the Sydney Grammar School and the university of Edinburgh (M.B., Ch.M., 1895; F.R.S.C. Edin., 1910). On his return to Australia in 1898 he was attached to the Royal Prince Alfred hospital (in which he eventually became senior honorary surgeon), and in 1911 made lecturer in clinical surgery at the university of Sydney. In 1915 he went to England as lieutenant-colonel in command of the Australian auxiliary hospital at Wandsworth, and afterwards to the front as surgeon-specialist to No. 2 Australian Casualty Clearing Station. In 1917 he was invalided back to Sydney, and was surgeon-specialist to Randwick military hospital until the end of the war. In 1922 he published *Post Mortem,* a series of historical sketches dealing with the pathology of famous men and women after a fashion previously adopted only by French medical experts. His second book, *Mere Mortals* (1925, published posthumously), is of the same *genre.* He died at Rose Bay near Sydney on 19 April 1925.

L.G.D.

MacLaurin, SIR HENRY NORMAND (1835-1914), born at Kilconquhar in Fifeshire in 1835, and educated at the universities of St. Andrews and Edinburgh (M.D., 1857), joined the navy in 1858 as assistant-surgeon and served at Athens during the revolution of 1862. Later he was medical officer at Greenwich Hospital, but retired from the navy in 1871, migrated to New South Wales, and settled in Sydney. In 1883 he was elected a fellow of the university senate, in 1885 appointed chairman of the board of health and of the immigration board, and in 1889 nominated to the legislative council; in 1893-4 he represented the Dibbs ministry in that house. He was also a director of the Bank of New South Wales, and a trustee of St. Andrew's College within the university, and of the Royal Prince Alfred hospital. But his chief work was done for the university, of which he was vice-chancellor in

1887-9 and 1895-6, and chancellor from 1896 until his death on 24 August 1914. He took charge of university affairs at a critical stage in its history, when the government had considerably reduced the subsidy and was threatening to withdraw it altogether unless the department of education was given a much greater share in its control. He averted this danger, managed the Challis bequest (see CHALLIS, J. H.) so adroitly as to put university finance on a sound footing, and by his influence with political leaders secured fresh grants both for new professorships and buildings and for the general work of the institution. (Kt. Bach., 1902.)

MacLaurin, HENRY NORMAND (1878-1915), son of Sir H. N. MacLaurin (q.v.), was born at Sydney on 31 October 1878, educated at Sydney Grammar School and the university of Sydney (B.A., 1899), and called to the New South Wales bar in 1904. Joining the New South Wales forces, in 1899 he was appointed 2nd lieutenant (lieutenant, 1900; captain, 1903; major, 1908; lieutenant-colonel, 1913; colonel, 1914; brigadier-general, 1914). In 1913 he had been promoted to the command of the 26th infantry regiment (citizen forces) when, on the outbreak of the war in 1914, he was selected by General Bridges to train and command the 1st (New South Wales) infantry brigade. The appointment was almost experimental, MacLaurin being only 35 and comparatively untried; but his magnificent moral qualities enabled him to rise completely to the occasion. At the landing on Gallipoli, 27 April 1915, a few hours after relieving Colonel Sinclair-Maclagan (q.v.) and the tired staff of the 3rd brigade, both MacLaurin and his brigade-major, Irvine, while organizing resistance to an enemy counter-attack, were shot from the rear by Turkish snipers. Although the A.I.F. thus early lost an officer whom it recognized as the beau-ideal of Australian manhood, his influence among his subordinates was clearly discernible to the end of the war. It was several weeks after MacLaurin's death that an order was promulgated promoting a number of A.I.F. colonels, including MacLaurin, to the temporary rank of brigadier-general. He was therefore only known to the A.I.F. as colonel. See AUSTRALIAN IMPERIAL FORCE. C.E.W.B.

Maclay, N. DE M. See MIKLUHO-MAKLAY, N. N.

Macleay, ALEXANDER (1767-1848), head of a family that figured largely in the history of New South Wales for 50 years, was born in Ross-shire, Scotland, on 24 June 1767 and educated for commerce, but in 1795 joined the British civil service as chief clerk to the prisoners-of-war board, and from 1806 to 1818 was secretary to the transport board. In 1825, when the friction between Brisbane and his secretary Frederick Goulburn made it necessary to recall both of them, and Darling's reputation as a martinet seemed to indicate him as a suitable successor to Brisbane, Bathurst chose Macleay for the new governor's adviser, both for his common sense and for his experience of transport conditions, and persuaded him to take the secretaryship. Appointed to the legislative council on 20 December 1825, before he reached the colony, he assiduously carried out the constantly increasing duties of his office under Darling and Bourke from 7 January 1826 to 31 December 1836; he then retired from official life on his pension as ex-secretary of the transport board, but in 1843 was elected to the new legislative council by the counties of Gloucester, Macquarie, and Stanley (i.e. the north-coast district), and was made speaker. He retired from public life on 19 May 1846, and died on 19 July 1848.

Macleay's administrative and political work constituted only a fraction of the service he rendered to the colony. In 1794 he had become a fellow of the Linnean Society—then only six years old—and held its secretaryship from 1798 to 1825; the Royal Society made him a fellow in 1809 and a councillor in 1824, and several learned societies in foreign countries admitted him to membership. His special hobby was entomology, and in 1825 he was said to have the finest private collection of insects in existence. This collection—in making which he came into close relations with J. W. Lewin (q.v.) over some new Australian species—he brought almost intact to Australia, and it formed the nucleus of the great Macleay collection now in custody of the university of Sydney. But he also took an interest in ornithology, and made the Linnean Society many presentations of South American and Australian bird-skins both before and after his arrival in New South Wales. The residence of such a man in a colony that lacked almost every kind of scientific organization and equipment and had few learned men among its inhabitants, was of great value both as a stimulus and for the actual researches he instigated and undertook. He was possibly the first (in an article signed 'U' and published on 1 January 1828) to suggest the establishment of a museum, and certainly in 1832 formed a 'colonial museum' and procured for it an endowment of £200 a year. He was also the first president and staunchest friend of the Australian Museum from its incorporation in 1836, and was for many years president of the Australian Subscription Library. Residing at first in Sydney (the site of his house is now occupied by Loftus-street, between the lands and education departments), he received two grants of land, one of 54 acres at Elizabeth Bay, the other 2500 acres near Ulladulla; the first he made a nursery for rare trees, shrubs, and plants from all parts of the world—Joseph Hooker described it as a 'botanist's paradise'—and his use of the second for farming and stock-breeding was much praised by Darling; a block of 15,000 acres near Camden, which he bought in 1827, was similarly developed and used for experiments in horticulture and fruit-growing. His encouragement of exploration led to the naming after him of an island, a range of hills, and two rivers; and his botanical enthusiasm was commemorated by Robert Brown (q.v.) in the generic name of a poppy (*Macleaya cordata*) which has unfortunately been since re-absorbed in *Bocconia*.

He himself usually spelt his name McLeay; the forms M'Leay and MacLeay also occur. To prevent confusion, the spelling which was adopted by his son and nephew is here used for the whole family.

Of his 17 children two deserve special notice. WILLIAM SHARP MACLEAY (1792-1865), his eldest son, born in London on 21 July 1792 and educated at Westminster School and Trinity College, Cambridge (B.A., 1814; M.A., 1818), entered the diplomatic service and was for a time stationed in France, where he met Cuvier and other naturalists. From 1825 to 1836 he was stationed in Cuba to administer matters

connected with the abolition of the slave-trade; then, returning to England and retiring from the civil service, he was elected to the councils of the Linnean and Zoological societies and of the British Association for the Advancement of Science; about this time he discussed with Charles Darwin the publication of the results of the *Beagle's* voyage. Towards the end of 1838, partly to study Australian insects and partly because the English climate was too rigorous for him after so many years in the West Indies, he joined his father in New South Wales, reaching Sydney in March 1839. Here he busied himself with the collection of insects (to which he added P. P. King's specimens from northern and north-western Australia), the care of the Elizabeth Bay garden, and investigations into the local marine fauna. He was a trustee of the Australian Museum (1853-1862) and for some time a member of the national board of education. His published scientific work belongs mainly to the period before 1839. He had a gift for friendship, and knew intimately all the scientifically minded Australian visitors or residents of his day, among whom the two most notable were T. H. Huxley and Robert Lowe. He died on 26 January 1865.

Another son, Sir George Macleay (1809-1891), born in London and educated at Westminster, followed his father to New South Wales in 1827, and lived most of his Australian life at Alexander's Brownlow Hill farm near Camden, which after the father's death was left to him. His vigorous youth expressed itself largely in exploration, and in 1829 Sturt asked for him as a companion on the famous expedition to the mouth of the Murray; Macleay took his full share of the many hardships, and the friendship thus established was unbroken till Sturt's death in 1869. After his father's death George Macleay was elected to the legislative council by the Murrumbidgee electorate (1851-6), was a member of two committees on the constitution, and represented the same constituency in the legislative assembly in 1856-9, being in the latter year succeeded by his cousin William. Returning to England, he settled in Surrey, and for 30 years devoted himself to horticulture and the entertainment of Australian friends and men of science, returning to Australia for only a short visit—to settle the affairs of William Sharp, whose heir he was—in the early seventies. In 1869 he was given the C.M.G.—apparently a belated recognition of his share in Sturt's explorations, since it had been intended at the same time to give Sturt (who died on 16 June of that year) the knighthood of the same order. He died at Mentone, France, on 24 June 1891. (C.M.G., 1869; K.C.M.G., 1875.)

A trustworthy account of the family is J. J. Fletcher's presidential address to the Linnean Society of New South Wales, published in the society's *Proceedings* for 1920; for W. S. Macleay, Patchett Martin's *Life and Letters of Robert Lowe* should also be consulted, and for Sir George Macleay, Mrs. N. G. Sturt's *Life of Charles Sturt.*

Macleay, Sir William John (1820-1891), nephew of Alexander Macleay, was born at Wick in Caithness-shire on 13 June 1820, educated at the university of Edinburgh, and trained for the medical profession; but, his widowed mother dying when he was 19 years old, he was induced by his uncle to come to Australia, and reached Sydney with his cousin W. S. Macleay in March 1839. He took up sheep-farming, at first near Goulburn, later at Kerarbury on the Murrumbidgee, and for 15 years was known only as a successful breeder. In 1855, taking to politics, he was elected to the council by the pastoral districts of the Lachlan and lower Darling. When the new constitution came into force, the same constituency returned him to the assembly for the period 1856-9; in 1859 he succeeded his cousin George as member for the Murrumbidgee, holding the seat continuously until November 1874, when he resigned to undertake an expedition to New Guinea. On his return he was in October 1877 nominated to the legislative council, and remained a member till his death on 7 December 1891. He himself did not in later life use the name John, preferring to be known as William Macleay.

In 1863 he was chairman of a committee of the assembly on the defence of Port Jackson. In December 1864 he distinguished himself by his courage in repelling an attack of the bushrangers Gilbert, Hall, and Dunn at Plumb's Inn near Goulburn, and was one of the seven to receive as official recognition in 1875 a gold medal 'for gallant and faithful services' rendered during the bushranging epoch. An indefatigable worker in the cause of railway construction and inland communication, he had the satisfaction of being present in September 1878 at the opening of the railway to Wagga. He is best known as an entomologist, icthyologist, and patron of science. In 1875 he organized the *Chevert* expedition to investigate the fauna of New Guinea and the Torres Straits, and thus acquired a vast collection of specimens in all departments of natural history. He contributed to scientific journals numerous papers on Australian Coleoptera, and in collaboration with Dr. H. G. Alleyne published 'The Fishes of the *Chevert* Expedition.' His *Descriptive Catalogue of Australian Fishes* was of economic importance. For it he received a gold medal from the International Fisheries Exhibition in London; it also won him in 1880 the chairmanship of a commission to enquire into Australian fisheries, which resulted in the fisheries' act of 1881, still in force. The Macleay natural history collection, afterwards presented to the university of Sydney and housed in the Macleay Museum, was in part inherited from Alexander and W. S. Macleay, but was greatly enlarged by continual purchase of specimens and by the regular employment of professional collectors. Its value lies in its extensive representation of the Australian fauna. To this benefaction he attached an endowment of £6000 to pay the salary of a curator. In 1862 he founded the Entomological Society of New South Wales; it lapsed in 1873, but the next year its more comprehensive successor the Linnean Society of New South Wales (see Societies, Learned) was founded, and carried on chiefly through Macleay's generosity. When its library and effects were destroyed in the garden palace fire, Sir William largely replaced the library, and in 1885 gave the society land and a building, supplemented by an endowment of £20,000. Among his other benefactions were £12,000 for bacteriological research and £35,000 for the foundation of four research fellowships of £400 per annum in biology or geology—known as the Linnean Macleay fellowships, tenable by bachelors of science at the university of Sydney. For many years he was a trustee of the Australian Museum. (Kt. Bach., 1889.)

MacMahon, Sir Charles (1824-1891), son of an Irish master of the rolls, was born near Dublin on 11 July 1824, entered the army in 1842, saw service in Canada with the 71st light infantry and in India with the 10th hussars, retired with the rank of captain in 1851, served a short time in the Royal Irish Constabulary, and in 1852 migrated to Victoria, where next year he was made assistant-commissioner of police. In 1854 he became chief commissioner, but resigned in 1858 on account of a quarrel with the premier, O'Shanassy, and entered politics in 1861 as member for West Bourke. Curiously enough, he almost immediately became a minister without portfolio in O'Shanassy's ministry of 1861-3; but, although he represented the same constituency for another 20 years almost without a break (1866-78, 1880-6) he never again held office. From 1871 to 1877 he was speaker of the assembly; charged by Berry with undue favouritism to the McCulloch ministry of 1875-7 (during the notorious 'stonewall' and 'iron hand' episodes), he was rejected in 1877, but was replaced for a few months in 1880 when James Service was in office. He died at East Melbourne on 23 August 1891. (Kt.Bach., 1875.)

McMillan, Angus (1810-1865), born in Skye in 1810, migrated to Australia and landed in Sydney on 23 January 1838, and found employment on the sheep-station of Lachlan Macalister near Goulburn. Early in 1839 Macalister despatched McMillan 'to look out for stations' in the unknown region south of Monaro. Starting from Currawong on the Snowy River on 28 May 1839, he worked down the Snowy almost to Buchan, but was then forced to turn to Omeo, which had already been occupied. By the end of the year, however, he was settled on the Tambo, and in January 1840 forced his way down that river to the coast and traversed the Gippsland lake area as far as the Macalister and Latrobe rivers. A second journey in July took him no farther, but a third in October-November traversed the southern ranges to Tom's Cap; his next attempt, in February 1841, took him to Port Albert, and thus opened up a practicable route from Monaro to the sea, along which drays followed him in May. On the strength of this achievement he is always recognized as the discoverer of Gippsland (which, by the way, he called Caledonia Australis), although Strzelecki (q.v.), following his tracks in 1840 to the Macalister and thence striking south-west across the Thomson and Latrobe and encountering insurmountable difficulties in the ranges beyond, had by May 1840 extricated himself near Western Port and so reached Melbourne. It was, however, the fertile country of northern Gippsland and the track to Port Albert, with its facilities for shipping cattle, that the squatters desired, not the difficult ranges of Strzelecki's finding; so that, while the Polish traveller imposed his names on the map, the Scot remained hero of the adventure. After a good deal of nomadic squatting McMillan settled down at Bushy Park on the Avon, became protector of the local aborigines, and entered the Victorian assembly as the first representative of Southern Gippsland. In November 1864 he was asked by the government to open up tracks from Crooked River (near Dargo) to Omeo and Harrietville, and had completed 200 miles of them when illness overtook him and he died at Iguana Creek on 18 May 1865.

Maconochie, Alexander (1787-1860), born in 1787, entered the navy at the age of 15 and received his captaincy before the close of the Napoleonic wars. In 1836, while secretary to the Royal Geographical Society, he was invited by Sir John Franklin (q.v.) to accompany him to Tasmania as private secretary; they reached Hobart early in 1837. Before leaving England, Maconochie had been asked by the Society for the Improvement of Prison Discipline to report to them on the operation of the convict system; this request was officially approved on the understanding that communications should pass through the colonial office. In May 1837 Maconochie began to formulate an attack on the assignment system (q.v.) on the ground that under it punishment was uncertain, unequal and almost without exception demoralizing; he proposed to substitute for it the direct control of prisoners by official superintendents trained to develop a reformatory and social system of discipline—a somewhat sketchy proposal which he later developed into the 'mark system' explained under Convicts. Franklin submitted this report to men with much Tasmanian experience, and their comments were for the most part unfavourable; their evidence was forwarded to London in October, and printed in April 1838 as a parliamentary paper, *The Present System of Convict Discipline in Van Diemen's Land.*

Meanwhile Maconochie had interested himself also in the fate of the aborigines, suggesting to Bourke and the colonial office that they should be enlisted in the public service (especially in the constabulary), their families being encouraged to settle in native villages under government protection. Bourke was so much impressed by the scheme (which had already been tried on a small scale in Flinders Island) that he introduced it in a modified form in the Port Phillip district, and later in the year the colonial office recommended it to Gipps (see Black Trackers). In 1838, however, Maconochie, having alienated Franklin by his extreme attitude on convictism and his open attacks on local officials, was dismissed from office. He devoted his enforced leisure to a systematic development of his proposals, and in 1839 published in Hobart *Australiana: or Thoughts on Convict Management,* followed by *General Views regarding the Social System of Convict Management.* Meanwhile his earlier report had reached a wide public in England and considerably influenced the select committee of 1837-8 on transportation—which recommended that 'the mode of governing them (convicts) lately suggested by Captain Maconochie might in part at least be attempted with advantage.' When, owing to the pressure of public opinion the British Government decided to try out reforms on Norfolk Island, Maconochie was the obvious instrument; but the actual choice was left to Gipps, who consulted Franklin and obtained his approval of Maconochie's appointment.

The story of Maconochie's work at Norfolk Island in 1840-44 is told under Convicts. When he was relieved of office in 1844, he returned to England to open a long struggle with the home office and local authorities, who were wedded to the system of cellular isolation. 'Human nature' he wrote 'is not improved by being broken across.' In 1846 he published *Crime and Punishment,* which caused considerable stir among penologists; this was followed by a series of pamphlets dealing with his work at Norfolk

Island or explanatory of his ideas. In 1848 he published a pamphlet, *Emigration, with advice to Emigrants*, in which he endeavoured to prove the fallacy of the Wakefield system of colonization. In October 1849 he was appointed governor of the new Birmingham gaol, and was permitted to introduce the 'mark' system among the juveniles. But the assistant-governor, who had influence with the visiting justices, disapproved of his leniency; it was further said that he gave too much time to promulgating his theories and not enough to the details of administration, and in October 1851 he was forced to resign. He figured prominently during the proceedings of a royal commission appointed two years later to inquire into charges made against his successor, on the findings of which was based Charles Reade's *It's Never Too Late to Mend*. Despite great pecuniary loss and disappointment, Maconochie remained an indefatigable pamphleteer in the cause of prison reform. He did not, however, again hold office, and died at Morden in Surrey on 25 October 1860. (K.H., 1836.) See CONVICTS and NORFOLK ISLAND.

Macquarie, LACHLAN (1761-1824), born on 31 January 1761 on the island of Ulva near Mull in Argyleshire, was the eldest son of Lauchlan Macquarrie, 16th chief of the clan Macquarrie, who entertained Dr. Johnson during his tour of the Hebrides. Young Lachlan —who seems to have been responsible for dropping both the 'u' of his first name and the second 'r' of his surname—entered the army on 9 April 1777 (ensign, 1777; lieutenant, 1781; captain, 1788; major, 1796; lieutenant-colonel, 1802; colonel, 1810; major-general, 1813), and served with the 84th regiment in Nova Scotia and the 71st in New York and Charleston during the war of the American revolution. At the close of the war he was sent to Jamaica, and in 1784 placed on half-pay. In 1787 he was appointed to the 77th regiment on condition of raising 15 recruits for it (he managed to obtain 17). Leaving England on 28 March 1788 for India with his regiment, in Cape Town he met William Bligh—then on his way to Tahiti in the *Bounty*—and took him aboard the troopship for dinner and dancing. In India he saw active service against Tippoo Sahib at the sieges of Cannanore (1790) and Seringapatam (1791); also in the Dutch settlement of Cochin on the Malabar Coast (1795), in Ceylon (1796)—where he was given separate command—and at the second siege of Seringapatam in 1799. In 1793 he married Jane Jarvis, daughter of the chief justice of Antigua, but she died in 1796 and left him for many years disconsolate. In 1800 he was made deputy-adjutant-general to David Baird, who had been given command of an expedition designed to co-operate with Sir Ralph Abercromby in driving the French out of Egypt; in February 1801 he left India, crossed Egypt from the Red Sea to the Nile, sailed down to Cairo, and arrived just in time to witness the capitulation of Alexandria. After returning to India in July to become military secretary to Jonathan Duncan, governor of Bombay, Macquarie went back to England early in 1803, was given the assistant-adjutant-generalship for the London district, and bought back a family estate on Mull which his father had been forced to sell to pay his debts. Anxious for once to remain at home —for he was in 1805 busily wooing the lady who became his second wife and gave her name to Mrs. Macquarie's Chair in the Sydney Domain —he appealed to both civilian and military authorities to be permitted to stay in London; but neither 'bad health' nor 'urgent private affairs' availed him, and in April 1805 he sailed for Bombay, nominally to rejoin his regiment (the 86th), but really to act once more as military secretary to Jonathan Duncan. By October 1807 he was back in London, after an overland journey from the head of the Persian Gulf across Persia, Armenia, and Russia. Meanwhile he had exchanged into the 73rd regiment, and had been gazetted its lieutenant-colonel as far back as 30 May 1805; after his marriage on 3 November 1807 he settled down at Perth, where the regiment was stationed.

In 1808 the news of the Bligh mutiny caused great searchings of heart at the colonial office, and Castlereagh (who then controlled the office) determined to substitute for the naval governors, always at loggerheads with a pseudo-military garrison, a series of military governors supported by their own regiments. To initiate this scheme he chose Colonel Nightingall, the commanding officer of the 73rd, and on 22 December 1808 Macquarie received orders to get the regiment ready for an early embarkation at Portsmouth. When in April 1809 Nightingall fell seriously ill and was compelled to resign his appointment, Castlereagh decided that the least embarrassing change would be to offer the post to Nightingall's next-in-command. On 8 May, therefore, Macquarie received his commission as governor and the local rank of colonel in New South Wales, sailed from England on the 22nd, and on 28 December reached Port Jackson. It is typical of the times that, although he anchored in Watson's Bay at 9 a.m. on the 28th, he did not reach Sydney Cove until the evening of the 30th, landing next day, and taking over control from Colonel Paterson on 1 January 1810.

To impress on the population the fact that mutiny and irregular government were at an end and the rule of law restored, Macquarie made this an occasion of much ceremony. His commission as governor was read at noon 'in the presence of all the inhabitants, with all due form and solemnity,' the 73rd and 102nd regiments (his own and the New South Wales Corps) being drawn up in a square at the meeting-place; in the evening there were bonfires and other illuminations. The impression made was good, and from that time forward 'due form and solemnity' accompanied the new governor's movements.

Macquarie's first despatch, penned nine weeks after his arrival, foreshadowed one side of his administrative activities. Insufficient accommodation, he wrote, compelled him to commence building barracks to hold 1000 men; a new general hospital was needed, as well as granaries, stores, and barracks for convicts; a surveyor-general and a competent architect should be sent out as soon as possible. Public buildings were evidently an important part of his schemes for the colony. A few months later he began town-planning. He divided Sydney into five districts, with a watch-house in each; the principal streets were to be 50 feet wide; he renamed them, and caused boards bearing the new names to be set up. Further, he laid out a market square in a central position, marked out a reserve, to be named Hyde Park, for recreation and amusement, and set apart as a common for grazing purposes the land which is now Centennial Park.

He next proceeded to inspect as much of the inland settlement as was at that time accessible. On 6 November 1810 he rode off at 6 a.m. to the upper part of George's River, inspected the farms there, and took a boat to examine the country along the river-banks. There and then he marked out the site of a new township to be called Liverpool after Lord Liverpool, then British prime minister. Bankstown, Botany Bay, Parramatta, Baulkham Hills, Menangle, and the Cowpastures on the Nepean were visited successively. Down the Nepean Macquarie journeyed to its junction with the Grose (which makes it the Hawkesbury), settled the sites for Windsor, Richmond (which he named), Pitt Town, and Wilberforce. On 10 December he was back at Castle Hill inspecting the government farm there, and returned to Sydney after 37 days' travel over practically the whole of the colony's hinterland. No governor before or since has displayed such energy and persistence in making himself acquainted with the country.

In 1811 Macquarie crossed Bass Strait and visited Hobart, the voyage occupying 19 days on account of stormy weather. At Hobart he settled the sites of new military barracks, a military hospital, a new general hospital, and a county gaol; named all the streets—calling the principal thoroughfare after himself—and caused signboards to be set up defining the limits and direction of each street.

His longest and most important journey was carried out in 1815, over the road made under his instructions by William Cox (q.v.) of Windsor. Most of the resounding names bestowed by him upon the ranges, rivers, and plains that he passed *en route* have gone into oblivion, but Mount York remains, and the Macquarie River, and the Lachlan River which Evans discovered shortly afterwards.

His many journeys familiarized him with the conditions prevalent in all parts of the settlement, and he was not slow to improve them where possible. The settlers on the Hawkesbury he helped through difficulties, first with floods and then with blackfellows. Those of them, on the other hand, who took advantage of the rough hill-country beyond to indulge in illicit distilling, and their accomplices who smuggled the raw spirits into Sydney, he pursued with the utmost rigour. Exploration he encouraged persistently, and his road-making and bridge-building were worthy of a Roman proconsul; the 276 miles of public road constructed during his governorship are evidence of his far-sightedness. See EXPLORATION BY LAND.

With the aborigines he first tried peaceful persuasion. With a strange lack of humour he had posted up on trees in the bush a proclamation addressed 'To the Black Natives,' which stated that their custom of assembling near the British settlements and there fighting and inflicting injuries upon each other was intolerable and inimical to British civilization. It added that, unless they desisted, they would be severely punished, and that further attacks upon white settlers would meet with retribution. This extraordinary proclamation was signed by John Thomas Campbell, secretary to the government. As the blacks took no notice, Macquarie despatched against them three military detachments, with white settlers and friendly natives as guides, to the Cowpastures and the regions beyond Liverpool and Windsor, with instructions to clean up the whole country from the Kurrajong to the Illawarra. After a month the expeditions returned with a number of prisoners, including four small black children (two boys and two girls); with these Macquarie founded a school for aboriginal children at Parramatta, but at the annual muster of blacks at Parramatta returned them to their relatives.

The settlers on the Hawkesbury gave much provocation to the blacks. Many who were emancipists were lazy, improvident, and addicted to drink, and the high prices for rum charged by Macquarie's contractors for Sydney hospital (see HOSPITALS) gave an impetus to the manufacture of 'moonshine' in the Hawkesbury ranges. One result was that wanton attacks were frequently made by drink-maddened settlers upon the neighbouring aborigines, and their reprisals—justifiable though they were—led to punitive expeditions against them by Macquarie's orders.

In his treatment of the convicts, who formed such a large part of the population, Macquarie found himself in conflict with the justiciary, the magistrates, the chief officials, and the free inhabitants of the colony. He held that, when the criminal had purged his offence, he should be allowed an opportunity to build up his life anew. Accordingly he went on board every convict transport as it arrived and delivered a homily, in which he explained to the transportees that their former misdeeds would not be remembered against them in this new country, and that it depended upon themselves to remake their lives. Hardened criminals scoffed at the exhortations, and took advantage of the exhorter whenever possible.

In order to secure labour for his building and town-planning schemes he kept numbers of prisoners in Sydney and in the other towns that he founded. In particular he retained the services of almost all the skilled mechanics, to the great chagrin of the free immigrants who wanted skilled labour to develop their land-grants. Moreover, the officials and the free immigrants drew between themselves and the convicts an impassable line which Macquarie flatly refused to recognize. It was a fixed principle with him that men whose sentences had expired, or had been remitted for good conduct (emancipists, q.v.), should be helped to forget their past. He extended the hospitality of government house to such men as James Meehan (q.v.) and William Redfern (q.v.), both men of education and talent. Meehan became assistant surveyor-general, accompanied Macquarie on most of his inland journeys, and was a constant guest at government house. Redfern became Macquarie's family physician. The governor's habit of inviting these emancipists to his table caused many 'exclusives' to refuse his invitations, and when in 1819 John Thomas Bigge (q.v.) came out to report to the colonial office on Macquarie's administration, he was scandalized to find that he was expected to sit at the same table with persons who had worn the broad arrow.

Andrew Thompson, a settler on the Hawkesbury, had been transported for setting fire to a stack, had served out his sentence, and grown wealthy as a government contractor, trader, and money-lender. In the first year of his governorship (1810) Macquarie made Thompson chief magistrate for the Hawkesbury. The appointment was hotly resented by the free population. Thompson died in the same year, and Macquarie on hearing of his decease wrote of him as 'an

excellent worthy man and much and justly regretted by every one.' Then it was learned to the amazement of the public that Thompson had left one-fourth of his fortune (which was estimated at £25,000) to the governor—'a most extraordinary instance of friendship and gratitude,' comments Macquarie. Bigge, however, although he censured the governor's administrative conduct severely, expressly reported that he found no trace of corruption in any of Macquarie's actions, and that no breath of suspicion in that regard affected his reputation. For Macquarie's attempt to force the supreme court to admit convict attorneys to practice before it see BENT, ELLIS. Earl Bathurst in 1817 administered a mild reproof, which Macquarie's proud spirit could not brook. He tendered his resignation; Bathurst immediately reassured him and begged him to withdraw it. Unfortunately that letter did not reach its addressee—the post-office was not incorruptible in those days, and it is at least conjecturable that the letter was impounded in transit by some agent of one of the governor's numerous enemies.

In the same year (1817) a certain William Blake, with several others (all of very doubtful character and engaged in very questionable practices), was arrested by soldiers of Macquarie's bodyguard as a trespasser in the private grounds of government house. Macquarie sent the offenders to a magistrate, who sentenced the women to a short term of imprisonment and the men to a dozen lashes apiece. Blake protested that he was a free settler and that it was contrary to the principles of British justice that a free man should be flogged for trespassing. Macquarie refused to interfere with the sentence, and Blake was flogged; he took his tale to Samuel Marsden and Jeffery Hart Bent, who advised him to go to England and present a memorial to Earl Bathurst (they also supplied the funds for his journey). Blake's complaints seem to have been the 'last straw' on the back of the colonial office, which promptly sent out Bigge. Bigge's reports, when they appeared, were on the whole adverse to Macquarie, emphasizing particularly his excessive expenditure on public works (Bigge had no great belief in the colony's future), his attitude to emancipists, and his handling of the 'rum' traffic. But long before these reports had reached London the governor's fate was decided. The non-receipt of any answer to his proffer of resignation in 1817 deeply wounded Macquarie's pride. In February 1820 he told Bathurst of 'the regret and mortification I feel at your Lordship's not condescending even to notice the receipt of my Letter of Resignation,' and again urged that he should be allowed to retire from a situation in which he had been harassed and calumniated beyond endurance. In July Bathurst gave him the long-desired leave, and in November let him know that Sir Thomas Brisbane had been chosen as his successor. Macquarie's acknowledgment in March 1821, emphasizing 'the many indignities and mortifications I have experienced for the last Eighteen Months,' betrays his real feelings about Bigge—whom, curiously enough, he had at first admired for 'his very gentlemanly manners and polite address.' On 1 December the retiring governor handed over his charge to Brisbane, and in February 1822 left Port Jackson in the ship *Surry* for England, where he lived quietly in London until his death on 1 July 1824. His diaries (which are especially voluminous for the period of his Australian governorship), and a mass of memoranda covering the greater portion of his life, are in the Mitchell Library at Sydney.

Macquarie's foibles, and his entire disregard of other people's personal feelings when he felt himself justified in rebuking them, have done his reputation great harm. No man could incur the enmity of Marsden, Bent, and Bigge and escape unscathed. But John Macarthur, who disliked as much as anyone Macquarie's emancipist policy and had no special reason to love him, told a disgruntled official at the colonial office:—'Governor Macquarie is a gentleman in manners, human and friendly to all . . . a man of unblemished honor and character altho' it may not have been his lot to do that which I think no man ever will do—to give satisfaction to all.' Macquarie's habit of attaching his own name to various places and buildings has been much jeered at, but greater men have had worse foibles, and he made his friends and best officers eponyms too; it may be added that the Lachlan River and other Lachlans commemorate his young son, not himself.

Foibles and mistakes, however, are far outweighed by the active excellence of his personal rule. In the proud *apologia* for his administration which he addressed to Bathurst on 27 July 1822 he set forth a few of his claims to the gratitude of the colony and of Britain:—

> I found the Colony barely emerging from infantile imbecility, and suffering from various privations and disabilities; the Country impenetrable beyond 40 miles from Sydney; Agriculture in a yet languishing state; commerce in its early dawn; Revenue unknown; threatened by famine; distracted by faction; the public buildings in a state of dilapidation and mouldering to decay; the few Roads and Bridges, formerly constructed, rendered almost impassable; the population in general depressed by poverty; no public credit nor private confidence; the morals of the great mass of the population in the lowest state of debasement, and religious worship almost totally neglected.

He goes on to enumerate his measures against immediate famine, his social and moral reforms (deliberately including his encouragement of emancipists), his insistence on religious worship and on marriage (as against 'the disgraceful and immoral state of Concubinage, which I found generally prevailing'), his works policy, his treatment of the aborigines, his orphan schools (male as well as female), and many other policies and institutions for which he had been responsible. His statistics of the colony's growth may be shown in tabular form:—

	1810	1821
Population	11,590	38,778
Cattle	12,442	102,939
Sheep	25,888	290,158
Acreage cleared and tilled ..	7,615	32,267
Customs duties levied, about ..	£8,000	£38,000

He added a list of public works occupying over 17 pages of the *Historical Records of Australia*—at Sydney, Parramatta, Newcastle, 17 other townships east of the Blue Mountains and two west, Hobart and two other townships in Tasmania, besides five turnpike roads (80 miles) and nine other carriage roads (196 miles). These are practical evidence of his good government; but it was his unbreakable confidence in the colony's future, his stimulating enthusiasm for every advance in material or moral welfare, his clear-cut determination to make New South Wales there and then a model reformatory and, in good time, free and self-supporting, that constitute his claim to rank

as the greatest and most beneficent governor Australia has seen.

See Bathurst's *Instructions to Mr. Bigge*; Bigges *Reports*, 3 vols. (London, 1822-3); and Phillips's *A Colonial Autocracy* (London, 1909).

J.Sa.

Macquarie's second wife, born Elizabeth Henriette Campbell (1778?-1835), deserves notice not only for the aid she gave her husband in all his benevolent enterprises but for her own independent influence on the development of New South Wales. This, as might be expected, was exercised chiefly in respect of charitable work, especially among the women of the settlement; thus Macquarie's reform of the female orphan institution, though officially attributed to him alone, was known to be largely of her devising, and Michael Robinson (q.v.) explicitly celebrates the 'maternal Fondness' that from that time on cherished the orphans. In the same way, while Macquarie established the school for aboriginal children at Blacktown, it was his wife who personally visited the school and taught the girls to thread needles and sing hymns. She exercised a steady supervision over the settlers' schools also, and consistently advised parents to have their children vaccinated. She was interested in architecture, had her say in the building of government house and of the church at Parramatta, and planned a road along the foreshores of Port Jackson from the mouth of the Tank Stream (q.v.) to Woolloomooloo Bay, on the western point of which she had a seat hewn in the rock to view the harbour. This seat, known ever since as 'Mrs. Macquarie's Chair' (the misnomer 'Lady Macquarie's Chair' is occasionally revived), still exists. Her Christian name was given to Elizabeth Bay, her maiden name to Campbelltown, and the name of her father's estate to the district of Airds near Appin. After Macquarie's death she lived on in London, made intermittently miserable by the profligacies of her son. She died at Jarvisfield in the island of Mull on 11 March 1835.

J.P.McG.

Macquarie Perch, a freshwater fish (*Macquaria australasica*) which is chiefly confined to the western rivers of New South Wales, though it also occurs in some eastern streams. It is a valuable food-fish, attaining a length of 15 inches, and is sometimes incorrectly called 'black bream' or 'blackfish.'

A.R.McC.

Macrozamia. See CYCADACEAE.

Madden, SIR JOHN (1844-1918), born at Cork in Ireland on 16 May 1844, and educated privately in England and France and at the university of Melbourne (B.A., 1863; LL.B., 1865; LL.D., 1869), came with his parents to Victoria in 1857. In 1868 he was admitted to the Victorian bar, and in 1871 entered politics, unsuccessfully contesting an election for West Bourke; this constituency, however, returned him to the legislative assembly at the head of the poll in 1874, and he joined McCulloch's fourth ministry (1875-7) as minister of justice. Seeking re-election after this appointment, he was rejected by West Bourke, but returned in 1876 by Sandridge (now Port Melbourne), and held that seat till the close of his political career. In 1880 he was James Service's minister of justice for five months, but did not hold office again, and in 1883 retired from politics. He refused several offers of a judgeship, but in January 1893 was made chief justice in succession to George Higinbotham (q.v.). On several occasions he administered the government of the colony in the absence of a governor (see GOVERNORS), and in 1899 was formally appointed lieutenant-governor. Outside politics and the law his main interest was in education. In 1875-9 he was warden of the senate of the university of Melbourne, in 1889-97 vice-chancellor, and from 1907 to his death chancellor. During a visit to England in 1906 he received honorary degrees from the universities of Oxford and Aberdeen. He died at Melbourne on 10 March 1918. (Kt. Bach., 1893; K.C.M.G., 1899; G.C.M.G., 1906.)

J.V.C.-B.

Mado, a small fish (*Atypichthys strigatus*) very common round wharf-piles in inlets along the coasts of the southern half of Australia. It affords endless sport to juvenile anglers, but is too small to be of value as a table fish, as it rarely attains a length of ten inches, and is usually much smaller. In colour it is yellowish, with several brown longitudinal bands. An allied species, *A. latus*, is commonly known at Lord Howe Island as 'leather-jacket,' but has no relationship to the true leather-jackets (Monacanthidae) which are so plentiful in Australian waters.

A.R.McC.

Magnesite, a mineral consisting chiefly of magnesium carbonate, occurs in all mainland States of the Commonwealth; some of the deposits are of considerable extent, and most of them of exceptional purity. Attunga near Tamworth (11,546 tons) and Fifield west of Parkes (2265 tons) were the main New South Wales sources in 1925; a little was raised near Cobar, but none in the Bingara and Braidwood areas, which had given good yields in previous years. The amount produced in New South Wales in 1925 was valued at £12,832. A few tons are raised at Heathcote in Victoria and at Beetaloo in South Australia. The deposits near Rockhampton and Bowen in Queensland, Tumby Bay and Leigh Creek in South Australia, and Bulong near Kalgoorlie in Western Australia, are not being worked. The mineral is used principally for fire-bricks and furnace-linings, and sometimes for flooring. The establishment of a flourishing magnesite industry is hampered by the lack of a market for the large amounts of carbon anhydride obtained during its treatment; as long as this by-product cannot be utilized, the mineral does not pay for working in the small quantities required by Australian industries.

Magnoliaceae, a family of trees or shrubs spread chiefly over tropical and temperate Asia and western America. Two genera with seven species are indigenous to Australia. *Drimys* has five indigenous species; *D. aromatica* (Pepper Tree) is in the humid coastal forests a large shrub or small tree, but becomes a dwarfed, prostrate shrub at the 5000-feet levels of the Australian Alps or the mountains of Tasmania. It has small greenish-yellow flowers and globular berries; the latter are a fair substitute for pepper or allspice. The leaves and bark also have a hot, biting taste. The bark closely resembles that of *Drimys Winteri* (Winter's Bark, a South American species), and is said to be sometimes used instead of it as a remedy for scurvy.

Magpie-lark or **Peewee,** a black-and-white bird (*Grallina cyanoleuca*) peculiar to Australia, anomalous in form and habits. Its true position in classification is still uncertain, though

by some authors it has been placed among the Corvidae (crows) and by others among the Prionopidae (wood-shrikes). Throughout the greater part of Australia this is one of the commonest and best-known birds, and rejoices in a variety of popular names. The name 'magpie-lark' was presumably bestowed upon it because it runs on the ground like a lark and has pied plumage; 'little magpie' or 'Murray magpie,' also on account of its coloration; 'mudlark,' owing to its preference for the muddy banks of creeks and waterholes; and 'peewee' or 'peewit,' in imitation of its frequent call. Its food consists of pond-snails and insects; in search of the latter it visits open paddocks, gardens, and cultivated land, running actively about on its comparatively long, stilt-like legs. Its flight is peculiar, some-

Magpie-lark (*length* 10½*in.*)

what laboured though straight, and accompanied by noisy flapping of the rounded wings at the outset. Its call of 'peewee, peewee' is frequently uttered when it settles, and sometimes when it is on the wing.

The sexes are similar, but may be distinguished by the fact that the throat is black in the male and white in the female. The nest is an open structure, large in proportion to the bird, placed on the horizontal limb of a large tree and composed of mud, mixed with a little grass to strengthen it, and lined with grass. The eggs are four or five in number, whitish in ground-colour, and thickly marked with purplish-brown spots, which usually unite to form a zone round the larger end. When nesting, magpie-larks are pugnacious, chasing away crows, kookaburras, and even eagles from the neighbourhood of their home by darting at them while uttering their shrill call. In a chase of this kind other birds of the same species within hail will join. They are rather sociable with their own species, and large parties often unite during autumn and winter to roost in some favourite clump of trees.

W.B.A.

Magpies, perching birds about 17 inches in length, with black-and-white plumage, belonging to the genera *Gymnorhina* and *Strepera*. The former genus contains the birds universally known as magpies in Australia, though, as they have no special connection with the magpies of England and America, ornithologists have invented for them the names 'crow-shrike' and 'piping-crow.' The latter term may be said to have official or legal sanction, since the white-backed magpie, which appears in the coat-of-arms of South Australia, is described in the language of Heralds' College as a 'Piping-crow volant, perchant.' (The remarkable feat of flying and perching at the same time has been achieved by the artist who drew the bird for the coat-of-arms, but not by the bird itself.) The birds of the other genus, *Strepera*, are variously known as bell-magpies or black magpies, as well as by the aboriginal name of 'currawong' in New South Wales and Queensland, and by the less harmonious term 'squeaker' in Western Australia.

It was usual until recently to place *Gymnorhina* among the Laniidae (shrikes); *Strepera* was classed with the Corvidae (crows). As long ago, however, as 1876 A. R. Wallace suggested that they were closely related to one another and to the genus *Cracticus*, containing the Australian butcher-birds (q.v.), and recent investigation of their anatomy by Dr. J. A. Leach of Melbourne has confirmed this suggestion. The three genera, therefore, are now united to form the family Gymnorhinidae. Both genera of magpies are peculiar to Australia and Tasmania.

Throughout northern Australia and eastern Australia north of the Murray the Black-backed Magpie (*Gymnorhina tibicen*) is the representative of its genus; in eastern Australia south of the Murray, and in South Australia and Tasmania, the White-backed Magpie (*G. hypoleuca*) takes its place. The distinction between them is implied in their names, but in the region where the two species meet intermediates are not uncommon. In south-western Australia a third species, the Varied-backed Magpie (*G. dorsalis*), is found; the adult male of this form resembles the white-backed magpie, the females and young have the back mottled with blackish-brown, like the black-backed magpie.

Magpies are among the most popular of Australian birds through their abundance, their melodious songs, and their bold habits. When nesting, they will attack eagles and hawks, and even men. They do an immense amount of good by devouring grasshoppers and other large insects, and mice; but, unfortunately, in many districts their numbers have been seriously diminished by poison laid for rabbits. Their nests

Black-backed Magpie.
(*length* 17*in.*)

are large open structures of sticks, built in trees; they lay from three to five eggs, which vary greatly in colour—most are bluish-gray in ground-colour, with clouded markings of brown.

Magpies are often kept in confinement, and in addition to their own notes learn to whistle simple tunes and sometimes to speak a few words. They are sociable birds, uniting in flocks and

feeding harmoniously in company, often indulging in mimic contests and pursuit of one another, apparently for enjoyment. At the commencement of the breeding-season, however, the males become pugnacious and fight savagely.

The bell-magpies (*Strepera*) are shyer and less sociable birds than their relatives, and their loud calls, though fairly melodious, cannot be regarded as musical. They build large nests of sticks in trees, and lay three or four eggs, which are brownish with darker markings. Their food consists of insects and fruit, mostly obtained on the ground. The Pied Bell-magpie (*S. graculina*) of eastern Australia—oftener called 'scrub-magpie' or 'currawong'—is perhaps the best-known. The Hill Bell-magpie (*S. arguta*) is confined to Tasmania; the Black-winged Bell-magpie (*S. melanoptera*) occurs in Victoria and South Australia; the Black Bell-magpie (*S. fuliginosa*), often called the 'black jay,' is found in Tasmania (where it is known simply as the 'black magpie') and south-eastern Australia; the Gray Bell-magpie (*S. versicolor*) ranges from south-eastern Australia to the south-west, where it is called the 'squeaker.'

Other birds sometimes known locally as magpies are the chough, q.v., (occasionally called 'black magpie'), the magpie-lark (q.v.), called also 'little magpie' and 'Murray magpie,' and the white-shouldered caterpillar-eater or 'midget magpie,' a member of the family of cuckoo-shrikes (q.v.). W.B.A.

Mahony, Francis (1862-1917), son of an Irish father and a Cornish mother, and kinsman of the famous 'Father Prout'—Father Francis Sylvester Mahony—was born in Flinders-lane, Melbourne, on 4 December 1862 and brought to Sydney when he was ten years old. On leaving school he entered an architect's office, but much preferred attending Anivitti's classes at the old Academy of Art (see Art Galleries), and soon began to paint for a livelihood. Most of his black-and-white work was done for the *Picturesque Atlas of Australasia* and the *Bulletin*, or to illustrate volumes of Australian verse and prose; the Art Gallery in Sydney has three oil-paintings by him. While his special excellence lay in his treatment of horses—and he knew them 'inside out'—he dealt also with other phases of bush-life, and with Charles Conder and Henry Fullwood pioneered for artists the since much-bepainted Hawkesbury valley. For a time he was instructor to the Art Society of New South Wales; failing, however—mainly for personal reasons—to make his art provide a living in Sydney, he migrated to London in or about 1904. There he was occasionally seen at the Chelsea Arts Club, and oftener at the Langham Sketching Club, but lived for the most part as a recluse, and died in 1917. He was buried in Hanwell cemetery; a headstone, erected by old Sydney friends, marks his grave.

He was generally known as F. P. (Francis Prout) Mahony; but the 'Prout' was an addition of his own.

Maiden, Joseph Henry (1859-1925), born at St. John's Wood, London, on 25 April 1859 and educated at the City of London School, was prevented from entering Cambridge by ill-health that necessitated a voyage to Australia, and in 1881 was appointed curator of the New South Wales technological museum. In 1894 he became also superintendent of technical education, and established a system of instruction in wool-classing which has proved of great value. In 1896 he was made government botanist and director of the Sydney botanic gardens (q.v.), an appointment which involved the superintendence of the Domain, Centennial Park near Randwick, and the state nursery at Campbelltown. He largely remodelled the gardens, and established a national herbarium, to which through his agency were presented nearly 600 botanical specimens collected by Banks and Solander in 1770. In 1912-22 he was lecturer in forestry and agricultural botany at the university of Sydney. In 1900 he attended the international botanical congress held at Paris, and subsequently investigated European methods of forestry and horticulture; in 1904 he was invited to attend the Cambridge meeting of the British Association for the Advancement of Science. He was secretary of the Australasian Association for the Advancement of Science in 1907-21, and received in 1923 the Association's Mueller medal and in 1924 the Clarke memorial medal from the Royal Society of New South Wales. Among other honours bestowed on him may be mentioned the gold medal of the Linnean Society of London (1915), a fellowship of the Royal Society (1916), and the grand medal of the Acclimatization Society of France. In 1924 he resigned his appointments and lived in retirement, busying himself with botanical researches. He died at Turramurra near Sydney on 15 November 1925.

Among his published works are: *Useful Native Plants of Australia* (1889), *Flowering Plants and Ferns of New South Wales* (1895, in collaboration with W. C. Campbell), *Manual of the Grasses of New South Wales* (1898), *Forest Flora of New South Wales* (issued in parts between 1902 and 1925), *A Critical Revision of the Genus 'Eucalyptus'* (issued in 64 parts since 1910), *The Weeds of New South Wales*, and *Life of Sir Joseph Banks* (1909). His numerous contributions to periodical literature (especially to the *Agricultural Gazette of New South Wales* and the *Journals* of the Royal and Linnean societies of New South Wales) include short memoirs of Australian botanists, and papers on prickly pear, Australian fodder-plants, plants reputed poisonous to stock, wattles and wattle-barks. He was one of the founders, and for ten years president, of the Wattle League (see Wattle Day); twice president, and for 22 years honorary secretary, of the Royal Society of New South Wales; president, and for 37 years a councillor, of the Linnean Society of New South Wales; vice-president of the Australian Research Council; and, because of his interest in the acclimatization of Australian plants in California, a vice-president of the Forestry Society of California. (I.S.O., 1916.)

Maidenhair Fern. See Ferns.

Maiden's Blush. See Elaeocarpaceae.

Maiden's Blush Wood. See Anacardiaceae.

Maize. In the early days of New South Wales maize was more extensively grown than any other crop; in 1791 the area under maize at Parramatta was 300 acres, of wheat only 44—in 1792 1186 acres were under maize, and 208 under wheat. The maize-yield was allegedly 50 bushels per acre. Maize was also the principal crop at Norfolk Island, where it proved itself 'constant, certain, and plentiful;' as a rule two crops were harvested annually, averaging 45 bushels each. The yield often rose to 70-80 bushels, which amount was also obtained in the

alluvial river-flats of New South Wales. For the coastal districts it was a much more reliable crop than wheat. Even 40 or 50 years ago the area under maize was almost the same as that under wheat, but in recent years the coastal districts of New South Wales have found dairying more profitable.

Maize can be grown nearly everywhere on the mainland of Australia, but the highest yields are obtained in the eastern coastal districts. A large proportion is grown for green fodder and ensilage. It is excellent for sowing immediately after land has been cleared of timber, especially when the soil is rank or sour. When new land is cleared for dairying, it is a common practice to sow maize as a first crop, even before the timber is burnt off.

Almost the whole of the Queensland crop is grown in the Moreton (40 per cent), Darling Downs (28 per cent), and Wide Bay (22 per cent) districts. In 1909 the State department of agriculture acclimatized a large number of varieties from America. Both in New South Wales and in Queensland the government supplies seed to farmers, purchases, classifies, and grades their produce, and distributes fresh seed for the next season. In Victoria the area, though smaller than that in New South Wales, is much more productive. Good results are recorded from the sandy soils along the coast, which are not naturally fertile; whereas the acre-yield for the 11 years 1863-74 was only 15 bushels average, it has been steadily increased to the present high level (25½) by the use of good methods of cultivation.

The following are the figures for 1924-5:—

State.	Area under crop.	Yield.	Value.
	acres	bushels	£
New South Wales .	146,564	4,208,200	824,106
Victoria	23,126	891,987	189,547
Queensland	229,160	7,330,827	1,435,619
South Australia ..	7	276	87
Western Australia .	71	333	113
Federal Territory .	21	420	80
Commonwealth ...	398,949	12,432,037	2,449,552

The average acre-yield for the Commonwealth for the ten years 1914-24 was 24.59 bushels, which is 4.73 bushels less than that of the United States, the principal maize-producing country in 1923, but is satisfactory when compared with that of other countries. A small but fluctuating trade in the export and import of maize depends on the success or failure of the local crop. In 1915-16, a year of drought, nearly 4½ million bushels were imported; in 1923-4 the excess of imports over exports was 2,534,891 bushels. The 1924-5 year, however, was exceptional in that the surplus of exports over imports was 2,553,572 bushels.

The export-trade in cornflour is at present very small—in 1924-5 it was 19,177 lb. valued at £490. A moderate amount is annually imported, the principal sources being the United States and Great Britain; in 1924-5 the import was 299,198 lb. valued at £5273.

The principal varieties of maize grown in Australia are:—*Extremely early*: Sundown; *Very early*: Early Morn, Golden Glow; *Early*: Wellingrove, Gold Coin, Golden Superb, Kennedy, Golden Surprise, Iowa Silvermine, Funk's Yellow Dent, Iowa Goldmine, New England Whitetip, Auburn Vale, Craig Mitchell; *Mid-season*: Hickory King, Boone County White, Leaming, Coodra Vale, Golden Nugget, Early Clarence, Golden Beauty, Narrow Red Hogan; *Late*: Yellow Hogan, Fitzroy, Large Red Hogan, Yellow Moruya, Ulmarra Whitecap.

Factories for the manufacture of maize-products have been established in most States. From the endosperm are obtained cornflour and starches, of which some are used in laundries, some in the preparation of baking-powders and in the treatment of paper and cotton. From maize-starch is also obtained maize-syrup (glucose) which is used in technical processes connected with confectionery, jams and jellies, and fruit-preserving, as well as by tanners and brewers. Power-alcohol, dextrin, and gluten-meal are also obtained from maize, and the germ removed in the preparation of starch yields a valuable oil, which is used for soap- and paint-making, lubricating, and lighting, and can be converted into rubber-substitute. The mass from which the oil is expressed makes nutritious stock-food.

F.B.G.

Maklay, Mikluho. See MIKLUHO-MAKLAY, N. N.

Malachite. See MINERALOGY.

Mallee. See EUCALYPTUS.

Mallee Hen. See MOUND-BIRDS.

Mallophaga. See BITING-LICE.

Mallotus, a genus of Euphorbiaceae, widespread over tropical Asia and Africa; 10 species are indigenous to Australia, extending from New South Wales through Queensland to northern Australia. The male and female flowers are on distinct plants; fruit a red or yellow capsule, separating into two celled carpels. From the glandular hairs that coat the fruits of *M. philippinensis* is made a red powder, called by the Hindus 'kamala' and used by them as a vermifuge. Silk-dyers boil it with carbonate of soda to make a red dye of great beauty; the bark also is used for dyeing. The tree has a hard, tough timber, gray to light red in colour, which is liable to warp and shrink in drying. The capsules of *M. discolor* yield a yellow dye. This species has a soft, easily worked timber.

Malvaceae, a large and widely dispersed family consisting of herbs, shrubs, or soft-wooded trees with toothed, lobed, or variously divided leaves. Fifteen genera and 125 species are indigenous to Australia. The fruits are usually capsular, rarely a berry. The genus *Malvastrum* (herbs or undershrubs with red or yellow flowers) is chiefly American, with a few species in South Africa; two species are indigenous to Australia, of which *M. spicatum* is regarded by many squatters as a valuable fodder for sheep. The large genus *Abutilon* is well distributed over warm regions; 26 indigenous species—shrubs or herbs, usually with heart-shaped leaves—range across the continent. The flowers are yellow or white; fruit-carpels angular and pointed. The bark of *A. oxycarpum* yields a useful fibre. *A. indicum* possesses demulcent properties. Several species are in common cultivation as ornamental garden plants. The genus *Pavonia* is chiefly South American; the only indigenous species, *P. hastata* (also found in South America), extends from New South Wales to Queensland and is frequently grown as an ornamental shrub. The plants produce two kinds of flowers, one perfect, the other with the corolla suppressed and not opening (cleistogamous); both forms produce fertile seeds. The flowers shade from blue to purple, being darker at the base. The genus *Urena* is largely tropi-

cal, the only indigenous species, *U. lobata*, having a wide, warm-country range from Queensland into northern Australia. It is a tall herb, with pretty pink flowers, which are used in Brazil as an expectorant. The inner bark yields a fibre resembling jute. The genus *Lagunaria* contains one species, *L. Patersoni*, which extends to Norfolk Island. It is a coastal tree in northern New South Wales and Queensland,

Pavonia hastata.

and is frequently planted for shade and shelter in exposed positions on the sea-coast. The genus *Gossypium* (which includes the various exotic species or varieties that produce commercial cotton) is represented by *G. Sturti*, a shrub several feet in height, more or less marked with black dots. It is an inland species, ranging from South Australia to Queensland, and affords food for stock in dry country. See ADANSONIA, BOMBAX, HIBISCUS, LAVATERA, PLAGIANTHUS, SIDA, THESPESIA.

Mammals. The class Mammalia includes all those vertebrate animals in which the young are nourished for a time after birth by the milk of the female parent. The following orders of mammals comprise existing representatives:—

(1) Monotremata (monotremes).
(2) Marsupialia (marsupials).
(3) Edentata—sloths, armadillos, African and American anteaters.
(4) Cetacea—whales and porpoises.
(5) Sirenia—dugongs and manatees.
(6) Ungulata (hoofed mammals), comprising horses, rhinoceroses, tapirs, pigs and hippopotami, cattle, sheep, goats, deer and camels. With these are grouped elephants and hyraces, which, though not hoofed in the strict sense, are more nearly related to this than to any of the other orders.
(7) Carnivora, including cats, hyaenas, dogs, bears, weasels and otters, together with seals and walruses.
(8) Rodentia (rodents), comprising rats and mice, hares and rabbits, squirrels, jerboas, beavers and porcupines.
(9) Insectivora (insect-eating mammals), including moles, shrews and hedgehogs.
(10) Chiroptera (flying mammals)—bats, and 'flying foxes' or fruit-bats.
(11) Primates, including lemurs, apes and monkeys, and the human race.

The most important points to be noted in regard to the mammalian fauna indigenous to Australia are:—(*a*) the occurrence in this region alone of the only two surviving families of Monotremata; (*b*) the predominance of numerous and varied representatives of the order Marsupialia, which, at the present day, is almost entirely restricted to this region, though it was previously widely distributed; (*c*) the absence of representatives of most of the other orders.

See the various mammals under their own names, and consult Gould's *Mammals of Australia*; Lydekker's *Royal Natural History*, vol. iii; Beddard's 'Mammals' in the *Cambridge Natural History* (1902); Ogilby's *Catalogue of Australian Mammals* (1892); Lucas and Le Souef's *The Animals of Australia* (1909); Wood Jones's *The Mammals of South Australia* (1923-5).

W.A.H.

Mandated Territory OF NEW GUINEA, THE, comprises the north-eastern section of the island of New Guinea (under German rule known as Kaiser-Wilhelms-Land) and the islands adjacent to it, together with the Bismarck Archipelago and the two north-western Solomons. The area of the Territory is approximately 91,000 square miles, of which the mainland of New Guinea accounts for 70,000. On the north the Territory is bounded by a conventional line running along the equator from the 141st to the 160th meridian of east longitude; the western boundary-line runs due south along the 141st meridian to its intersection with 5° S. lat., and separates the Territory from Dutch New Guinea; the southern coincides with the northern boundary of Papua on the mainland, and runs thence along 8° S. lat. to the 154th meridian, and thence roughly north-eastward to the intersection of 4° 35′ S. lat. with 160° E. long.; the eastern boundary runs along the 160th meridian.

Discovery and Exploration.—For discoveries on the New Guinea coast before 1615 see AUSTRALIA, DISCOVERY OF. In 1615 the Dutch navigators Le Maire and Schouten made the first important surveys along the north-eastern coast of the island. In 1700 William Dampier (q.v.) visited and named New Britain and other islands off the north-eastern coast. In 1767 Carteret, and in 1768 Bougainville, surveyed part of the northern Solomons; in 1769 d'Iberville visited the islands off the north-eastern coast, and in 1788 John Shortland (q.v.), on his way back to England from Port Jackson, discovered the group that bears his name. Other visitors were Hunter in 1791, d'Entrecasteaux in 1792, and von Krusenstern in 1803-4. In 1827 Dumont d'Urville, and in 1838 McCluer, sailed along the north-eastern coast; Belcher in 1840 also visited these parts. John Moresby in H.M.S. *Basilisk* made surveys in 1874. In 1875-7 the *Challenger* expedition visited these

MAP OF MANDATED TERRITORY OF NEW GUINEA

waters, and Baron von Schleinitz (one of the few German visitors of the early days) explored the coast-line from Fortification Point to the mouth of the Sepik, as well as the Purdy Islands and parts of the Bismarck Archipelago. Between 1875 and 1885 four English naval officers—Lieutenants Bower, Richards, Oldham, and Field—surveyed the north-eastern coast, and in 1884 Finsch was engaged in similar work. Next year Germany annexed the Territory, and in 1895 the German survey ship *Moewe* began the survey and astronomical determination of many points along the coast of Kaiser-Wilhelms-Land and in the Bismarck Archipelago; in 1906 the *Planet* continued this work, surveying and charting the more important harbours, the traffic routes between New Guinea and New Britain, and the channels between the principal islands.

Up to this time the Germans had done little exploration work away from the coast of the mainland or the larger islands—it was not until 1913 that a serious attempt was made to examine the unknown interior. In 1886 the *Samoa* and in 1907 the *Siar* surveyed the lower part of the Markham River. In 1896 the Ramu River was entered by the *Ottilie*, and in 1898 by the *Johann Albrecht* and the *Herzogin Elizabeth*. In 1903 this river was ascended some distance by the *Stephen*. In 1909 the Hamburg South Seas expedition explored a small inland district of New Britain. In 1885 Dr. Finsch investigated the Sepik River (which was renamed the Kaiserin Augusta); in 1909 the Hamburg South Seas expedition explored it for 200 miles; in July 1910 the Dutch-German Boundary Commission traversed an area near the boundary from the northern coast to the Sepik. During this expedition Dr. Schultze discovered one of the river's main sources in the Peripatus Mountains near the Anglo-Dutch boundary. In 1913 the Stolle expedition again explored the Sepik valley and mapped out many tributaries. In July 1914 Commander Cumberlege of the Australian navy took destroyers 200 miles up the river and proceeded in the *Nusa* 150 miles farther. Since the Australian occupation New Britain has been crossed from Gasmata to Stettin Bay, and the Ramu River explored for 170 miles by an expedition under the leadership of Evan Stanley. There still remains a vast area of *terra incognita*, but exploration is progressing steadily; as in Papua, the dense, humid forests with their tangled mass of lianas and undergrowth, and the high, inaccessible mountain ranges, form a great barrier to journeys inland.

Physical Features.—At present the most important part of the Mandated Territory consists of numerous islands, the chief being the Bismarck Archipelago and the northern Solomons—together more than a quarter of the total area. The Bismarck Archipelago comprises more than 600 islands, the largest of which is New Britain (9266 square miles); New Ireland contains over 5000 square miles and New Hanover 579 square miles. Included in the Archipelago are the Admiralty group, consisting of Manus, Lou, Mbuke, Rambutyo, Baluan, Purdy (Nager) and several smaller islands; the Hermit and Ninigo groups and Kaniet, Sae, and Wuvulu islands lying north-west of the Admiraltys; and the St. Matthias group north of New Hanover. The northern Solomons include Bougainville (3500 square miles), Buka close to and north of it, and the Nukumanu, Tauu, Kilinailu, Nuguria, and Nissan groups, east and north-east of New Ireland. Adjacent to the mainland are Bagabag, Karkar, Manam, Long, Crown, Tami, Tarawai, Valif, Kairiru, Mushu, and the Schouten islands—these are not part of the Bismarck Archipelago. The island territory is for the most part volcanic and mountainous. Some of the islands, though but a few miles wide, rise to several thousand feet above sea-level, with a narrow coastal fringe of low or flat land. A few, however, are of comparatively recent origin, coral islands or atolls; others are of coral rock lifted well above sea-level. Most of the coral islands lie north-west of the Bismarck Archipelago and north and north-east of Buka and Bougainville; a few are near the coast of New Guinea, and among the smaller islands of the Admiralty group.

The concavo-convex island of New Britain has a very irregular coast-line and several good harbours—the most important being Blanche Bay with its inlier Simpson harbour, in the northern peninsula, and Talasea harbour on the main north coast. In the Witu group, north-west of New Britain, are two landlocked anchorages, Johann Albrecht and Peter harbours. At the north-western end of New Ireland is the fine harbour of Kavieng. On Bougainville good anchorages can be found at Kieta on the east, Tonolei on the south, and Gazelle harbour on the west; Buka has but one, Queen Carola harbour. Along the New Guinea coast good harbours are most numerous between Cape King William and the southern border, the more important being Morobe (Adolf harbour), Wurtemberg and Baden bays, the northern part of Sachsen Bay, Nassau Bay, Preussen Road, and Hanisch and Finsch harbours. The Maclay coast (see MIKLUHO-MAKLAY), which extends from Cape King William to the eastern end of Astrolabe Bay, has many more or less shallow bays separated by projecting headlands. North of Astrolabe Bay are Madang (Friedrich Wilhelmshafen) and Sek (Alexishafen) harbours. Aitape roads and Vanimo harbour lie towards the north-western end of the Territory.

There are swampy lowlands in the lower reaches of the larger rivers and occasionally for a few miles inland from the coast-line. Otherwise north-eastern New Guinea is extremely mountainous, as are most of the islands off it. Almost the whole Territory is covered with dense forests, grassy lowlands being rare. Close to the Papuan border in the south-west the Star Range forms the watershed between the Sepik River and the Fly River (in Papua). Its highest peak is Capella (13,000 feet). North-east of these mountains begins the main central range, which runs east and south-east through the Territory. In the west it is called the Victor Emanuel Range (10,000 to 12,000 feet), then the Central Range as far as Mount Hagen (11,500 feet), where it unites with the Schrader (7700 feet) and Bismarck ranges: in the latter are Mounts Herbert and Wilhelm, both over 13,000 feet. Near the source of the Ramu and Markham rivers the main range is known as the Kratke Mountains (Mount Zoller, 10,000 feet); near the Papuan border we know little about it, but its highest peak in this district is Mount Chapman (11,876 feet). Between the upper Ramu and the Maclay coast, opposite Vitiaz Strait, lies the Finisterre Range (Mounts Disraeli and Gladstone, 11,000 feet); this range continues into the Huon peninsula, where it is known as the Rawlinson and Saruwaged ranges —in the latter a peak of the same name is over 13,000 feet in height. Coastal ranges in the north-west run from the Dutch border to

Wewak opposite Musau Island; they are the Bougainville Range (4000 feet), the Torricelli Mountains (3000 feet), and the Prince Alexander Range (4000 feet). Between the Bougainville Range and the upper Sepik lie the Bewani Mountains (4000 feet). South of the Victor Emanuel Range, running into Papua, is the Müller Range, the highest peak of which is Mount Blücher. On the islands the highest is Mount Balbi (10,171 feet) on Bougainville. The whole of New Ireland is mountainous; the Schleinitz Range rises steeply to 4000 feet and includes an extensive limestone plateau 2600 feet above sea-level, called Lalet; on the north-eastern coast fertile plains lie between the sea and the mountains, but along the southern coast the Hahl and Verron ranges rise 6000 feet directly from the shore, and in the centre is the Hans Meyer Range. In New Hanover the Tirpitz Range rises 2870 feet, and on Manus there is a mountain of about the same height.

The mainland of New Guinea contains comparatively few evidences of volcanic action, but a curved line of crater islands (many active) stretches along the coast from the Schouten group to New Britain. The islands off the north-eastern coast of New Ireland are probably peaks of a submerged mountain-chain. In New Britain Ulawun (the Father, 7546 feet) and Bamus (the South Son, 7376 feet) are active volcanoes near Open Bay; on the Willaumez peninsula are several volcanoes of varying heights, and numerous geysers. In the extreme west is another group, of which Mount Talawe is said to be active. On the Gazelle peninsula near Blanche Bay there is a group of volcanic peaks, of which Tavurvur is still active at long intervals; the Mother (Kombiu, 2250 feet), the North Daughter (Towanumbatir, 1770 feet), and the South Daughter (Turanguna, 1750 feet), make up a conspicuous feature of Rabaul scenery. Lihir Island off New Ireland has active mud-craters. On Bougainville the central mountain-mass has crater-like formations, and Mount Bagana (6500 feet) is an active volcano. On Buka the southern ridges are of volcanic formation. Bam, Manam, and Karkar, which lie off the New Guinea coast between the Sepik and Madang, have on them active volcanoes.

On the larger islands there are few navigable rivers, and on the mainland only three of importance, the Sepik, the Ramu, and the Markham. The Sepik, which rises in the Star and the Victor Emanuel ranges, has a serpentine course of over 600 miles, flowing at first northward and then practically east for several hundred miles until it enters the sea near Cape Girgir. At its mouth it is about 2000 yards wide, and the shallowest part of the channel is 5 fathoms; it is navigable for large ocean-going steamers for 60 miles, and for smaller vessels (drawing up to 10 or 12 feet) for 300 miles. In the lower and middle reaches it flows through a broad plain, mostly of sago-swamps. Innumerable tributaries drain the ranges on either side, but many are soon lost in extensive flood-areas. The Ramu, which flows into Broken Water Bay, drains the central portion of the Bismarck Range on the west and the south-western part of the Finisterre Range on the east. Its mouth, 430 yards wide, is closed by a bar; but there is an entrance channel about 2¼ fathoms deep. It is approximately 400 miles in length. Between the sources of the Ramu and the Markham is a divide a few miles wide and only 1350 feet above sea-level. The Markham drains the southern portion of the Finisterre Range, the Herzog Range to the south, and the Albert Range near the Papuan boundary. Of minor importance are the Tami, near the Dutch border; the Golgol and the Kabenau, which flow into Astrolabe Bay; the Bulong, draining the Kai peninsula and flowing into Huon Gulf; and the Bu, entering the sea near Cape Rawlins. Close to and sometimes crossing the Papuan boundary is the Waria, which flows into Hercules Bay, and drains a large area of auriferous country.

Geology.—Until further geological field-work has been accomplished, it is impossible to map the exact localities where metamorphic rocks occur, but probably the greater part of the main central chain of mountains and many of its subordinate ranges make up together one great pre-Cambrian complex, which may also include the southern portion of the Bewani Mountains, the Adelbert Range, the Finisterre, Saruwaged, and Rawlinson ranges, and the Huon peninsula. Part of the Baining area in the Gazelle peninsula of New Britain is undoubtedly of this series, and gneisses have been reported in the Schleinitz and Rossel ranges of New Ireland and in the mountainous district of Bougainville south-west of Kieta. Archaean and plutonic rocks have been found throughout this series. Where these rocks occur in the head-waters of the Waria and its tributaries payable gold has been obtained; the area including the upper waters of the Ramu and Markham is somewhat similar, but has not been proved to contain gold in payable quantities. Pre-Cambrian and archaean schists are represented in the Hunstein Mountains on the middle Sepik, and are well developed (with diorites and diorite porphyrites) in the ranges south of the Sepik and east of the 142nd meridian. Serpentinized peridotite, associated with plagioclase basalts which intrude late Tertiary limestone, has been discovered in the north-western corner of the Bougainville Range. Plutonic and hypabyssal intrusions occur in the Bewani and Finisterre ranges. In New Hanover and New Ireland older igneous rocks have been noted, but very little is known about them. Throughout the volcanic zone the younger effusive series of rocks is predominant. On the October River (a tributary of the Sepik near the 141st meridian) outcrops of Mesozoic rocks were found, and on examination were reported to contain fossils like those of Jurassic strata in the Moluccas. In the Bougainville Range and the Torricelli Mountains Cretaceous beds have been recorded, and alveolina limestone in the Finisterre Range near Mount Disraeli; the limestone massif in the Saruwaged Range is also probably alveolina. The Papuan government expedition of 1924 found *Lepidocyclina* limestone on the southern slopes of ranges drained by the Fly and Palmer rivers, so that earlier (possibly Mesozoic) rocks may occur on the northern slopes of the divide in the Mandated Territory. Of the early Tertiary series, oligocene and eocene limestones and glauconitic sandstones have been recorded from the south-eastern and western slopes of the Verron Range in New Ireland, and from the northern slopes of the Bewani Mountains on the mainland. There is still much field-work to be done before this series can be fully located. Of the late Tertiary series more is known.

According to Evan Stanley late Tertiary limestone is well developed on most of the islands. On the mainland the series is mostly restricted to the littoral in the north-east, but east of

Aitape extends into the mountains. On the 141st meridian, south-east of Germania Point, lies an extensive limestone plateau 600 feet above sea-level; and it is probable that all the coastal sandstone ranges in the north-west are capped with coral limestone. In the Bewani Mountains brine-springs—usually associated with occurrences of petroleum (see OIL)—have been recorded; it is probable that Plio-Miocene oil-bearing strata stretch along the coast-line from the Dutch boundary to Astrolabe Bay, being more in evidence in the Vanimo, Aitape, and Madang hinterlands and up the Sepik valley. In the Gazelle peninsula of New Britain a Plio-Miocene series like the oil series of Papua is found in the Toriu valley, but volcanic activity in the neighbourhood may have prevented the deposition of oil in payable quantities.

Minerals and Mining.—Gold, osmiridium, platinum, tin, copper, sulphur, magnetite, manganese, and lead have been discovered, but only gold has been exploited. Phosphatic rock is obtainable in payable quantities in the Purdy Islands; west of Cape Croiselles, on Dylup plantation, the rock may contain a sufficient percentage of phosphates to make it payable, but more careful examination is required. Brown coal has been found, but may not be commercially utilizable. Clays in large quantities (some of high quality) are obtainable in various parts of the Territory, but have not been worked. Reference to the oil series has already been made; several companies are prospecting and arranging for the development of the fields, but up to the end of 1925 oil in payable commercial quantities had not been discovered.

Under the mining ordinance of 1922 a gold-field has been proclaimed in the Morobe district, and four mineral-oil and coalfields in the Aitape, Madang, Namatanai, and Kieta districts. Thirty-five miners' rights have been issued, and 36 dredging and sluicing leases. Since January 1924, when the Territory was thrown open for private enterprise, 26 mineral-oil and coal licences have been issued to prospecting companies. For the year ending 30 June 1925, 7417 oz. of gold, valued at £18,512, were exported.

Meteorology.—Like Papua, the Mandated Territory has two seasons, the north-west monsoon, from December to April—this is usually the wet season, and winds fluctuate from NW. to NE.—and the south-east trade, from May to November, which is generally accompanied by a small rainfall. Along the mainland littoral the average temperature varies from 78° to 82° Fahr.; this is low, considering its proximity to the equator, and is probably caused (*a*) by the cool north-westerly current which strikes the coasts during the south-east season, (*b*) by the numerous high mountain ranges, which cool both the north-west and the south-west winds. Hurricanes do not occur, and storms are not so violent as those prevailing farther south. On the whole the climate may be called equable, though on some islands the humidity is great and the climate enervating. Malaria is common throughout the Territory, but good health may be maintained by the judicious use of quinine, regularity in other habits, bodily exercises, and a very temperate use of alcohol. Of course even these precautions will be of no avail unless mosquito-breeding areas are reduced to a minimum.

Fauna.—Like Australia, the Mandated Territory has a great variety of marsupials and a scarcity of mammals. Of marsupials there are over 40 species, among which are two kangaroos (*Macropus papuanus* and *Thylogale jukesi*); three varieties of dorcas kangaroo (*Dorcopsis*) on the mainland, and one in the Bismarck Archipelago; and several species of tree-kangaroo (*Dendrolagus*). The Phalangeridae include one cuscus (*Cuscus masculatus*), a small squirrel-like flying opossum (*Petaurus papuanus*) found in the Solomons, two striped opossums (*Dactylopsila*) noted on the mainland, and several ring-tailed opossums (*Pseudochirus*) which occur throughout the Territory. One bandicoot (*Perameles cockerelli*) has been discovered in the Bismarck Archipelago; others are said to exist on the mainland. In the larger islands off the coast the pouched rat (*Phascogale*) occurs, as well as a native porcupine (*Zaglossus*). Among mammalia, several flying foxes (*Pteropus*) occur on the mainland, and a smaller one (*Syconycteris australis*) in the Solomons and in New Ireland. The numerous rodents include *Uromys, Chiruromys, Pogonomys,* the giant rats (*Mallomys rothschildi*), and one or two species of water-rat (*Hydromys*). Pigs and dogs are widely distributed, but not indigenous. Cattle and sheep, too, have been introduced and bred successfully. Off parts of the coast the dugong (*Halicore australis*) is found. Fishes, both freshwater and marine, abound, and the Samoan 'palolo worm' is used as food by the natives of the Bismarck Archipelago.

Reptiles are represented by a crocodile (*Crocodilus perosus*), the hawk's-bill turtle (*Chelone imbricata*) which approaches the coast from July to December, a river turtle, and a land tortoise. Monitors (Varanidae) are widely distributed, and there are several families of smaller lizards, including the skink. Frogs and toads are numerous. Over 20 species of snakes have been recorded, among them the python of the Bismarcks, where also is to be found a very poisonous snake, *Pseudelaps mulleri.* Four varieties of venomous water-snake are found; one in particular (*Platurus colubrinus*) is notable as being found among holes in the coral and on trees washed ashore.

Bêche-de-mer (*Holothuria*) is plentiful in several parts of the Territory, and pearl and trocas shell are also obtainable in commercial quantities.

Of the 178 species of birds known at present in the Territory 74 are also found in Europe, among them finches, woodpeckers, vultures, hawks, falcons, owls, hornbills, parrots, and cockatoos. Among the parrots the most noteworthy are *Eclectus pectoralis,* a *Nasiterna,* and a *Loriculus,* and among the cockatoos the brilliantly-coloured *Plissolophus ophthalmicus.* Only 12 of the 18 varieties of pigeons are represented in the islands—the most remarkable is the crested goura. Birds of paradise are distributed throughout the Territory in great variety. Of eight species of mainland cuckoos only one is found in the archipelago. The cassowary is represented by one species (*Casuarius bennetti*) and the scrub fowl by one (*Megapodius eremita*). Wild ducks and geese have also been noted. The few land mollusca which have been distinguished seem to show a relationship with those of the Indo-Malayan regions.

Flora.—The indigenous flora of the Territory seems to be largely blended with Indo-Malayan, Polynesian, and Australian types, but of the 753 species of plants found in New Guinea and the islands over 200 are endemic. In the

Solomons a species of the Zingiberaceae and one of the Sapotaceae are peculiar to the district. Among the numerous indigenous economic plants may be noted *Indigofera tinctoria*, which grows in parts of the Bismarck Archipelago; the areca palm, which supplies the natives with betel-nuts; three varieties of bread-fruit (*Artocarpus integrifolia, A. incisa* and *A. polyphema*); numerous varieties of the banana; and yam (*Dioscorea*), taro (*Colocasia esculenta*), and sweet potato (*Ipomoea batatas*) form the staple diet of the natives in addition to the fruitful coconut and the introduced cassava (*Manihot jotropha*). The sago (*Metroxylon rumphii*) is widely distributed, especially in the vast swamps of the middle Sepik. Another variety (*M. oxytracteatum*) has been distinguished near Finsch harbour. On Buka and Bougainville the natives utilize one of the Cycadaceae, from which they obtain their starchy food. In the mainland ranges a species of *Pandanus* is cultivated and supplies a food-product from its fruit. Many trees produce edible nuts in the dense forests, where wild nutmegs and ginger also grow. The sugar-cane is cultivated. Rattans and bamboos are widely distributed, and in New Britain a fibre (*Pueraria novoguineensis*) is used in the manufacture of native fish-nets. In the archipelago the pounded nuts of *Parinarium laurinum* are utilized in making a cement for caulking boats, and as a plastic mass for covering ceremonial masks. The ivory-nut palm (*Coelococcus salomonensis*) grows well in the Solomons. Tobacco is probably an introduced plant; though widely distributed, it does not seem to grow with an excellent flavour in the islands, but on the lower Sepik and Ramu, where it is prolific, better samples have been obtained. In 1882 Parkinson introduced into New Britain maize, water-melons, pumpkins and pineapples, and all have thrived excellently. Other economic plants of importance are: the nipa palm (*Nipa fructicans*) found along the tidal reaches of rivers; several varieties of mangrove (*Rhizophora*); and many timber-trees, among them cedars, acacias, eucalypts, ebony, sandalwood, *Calophyllum* (which grows only on the coast), and the shade-trees *Terminalia catappa* and *T. okari*. The latter species is confined to the mainland; the kernels of its large nuts, which have an almond flavour, are of great food-value. Two sawmills are operating in New Britain and one at Sek harbour near Madang. Most of the timber cut is used locally. As a forestry expert has not yet surveyed this territory, it is impossible at present to forecast the future of the timber industry, but the minor forest products—medicinal plants, rattans, and fibres, and perhaps gums—could be developed commercially.

Agriculture.—At the Rabaul botanical gardens experimental planting is carried out, and from it economic plants, cuttings, and seeds are distributed. Here also the special variety of eucalypt seedlings are raised for eventually planting in the vicinity of quarantine and other stations on account of the tree's salubrious exhalations. Sudan and other grasses have been grown successfully in experimental plots. Cocoa, coffee, rubber, arrowroot, kapok, and sisal hemp can also be cultivated to advantage, but at present there is little exportation of these except cocoa, grown principally at Vitu, but there are also small plantations at Madang and in New Ireland. There is no doubt that the Territory could produce far more cocoa and find a market for it in the Commonwealth, and this should not be lost sight of in dealing with the native plantations. During the last few years the exports of cocoa-beans, rubber, sisal hemp, and minor agricultural products have steadily decreased.

Copra on the other hand shows a substantial increase, but this has come about more or less automatically as fresh areas have come into bearing. There are between 350 and 400 coconut plantations in the Territory, on which 176,605 acres have been planted up, including 80,000 acres now in bearing. Of native-grown copra 6000 tons are produced annually. Swamp-rice has been experimented with successfully at Sek, and there seems no reason why the natives should not be instructed in the cultivation of this variety, as well as in the cultivation of upland rice which grows so well in Papua. Vanilla, nutmeg, lemon-grass, and maize also grow successfully. The agricultural exports for the year ended 30 June 1925, with their value in pounds sterling, were:—

	Tons	Value
Copra	39,151	815,938
Cocoa beans	135	6,949
Ivory nuts	27	312

Land and Land Tenure.—Before the Australian occupation in 1914 the German government had sold or leased to colonists and companies a total of 702,220 acres; the New Guinea Company held 369,880 acres, other companies 73,700 acres, missions 80,700 acres, and individual planters 177,940 acres. In 1922, civil government having been restored, a land ordinance similar to that current in Papua prohibited Europeans from purchasing land from a native. The administrator alone has the right to purchase, and may lease purchased land for a period up to 99 years. In agricultural leases of more than 30 years' currency the rental is 5 per cent per annum on the unimproved value—the rental for the first 10 years may be remitted. When the lease is for 30 years or less, the rental during the whole term is 5 per cent on the unimproved value, appraised every 10 years. The maximum land-area which can be held under one agricultural lease is 5000 acres. Of land under lease one-fifth must be planted during the first five years, another fifth during the second five years, three-fifths in all during the first 20 years, and at least three-quarters during the remainder of the lease.

Pastoral leases may not exceed 30 years; the rental is 2½ per cent on the unimproved value, but during the first 10 years must not exceed 10s. per 1000 acres. The unimproved value is appraised every 10 years, and within the first 10 years for each square mile leased 20 head of cattle or 100 sheep must have been placed on the land.

History to 1914.—Early in the forties of the last century colonization was much discussed in German political circles, and in 1856 von Graeve advocated the establishment of German colonies in the South Seas—more particularly in the island of New Guinea, half of which at that time lay unclaimed by any European Power. But Bismarck, then German chancellor, was too much occupied with civil and military affairs to trouble himself with suggestions for colonial expansion. It seemed to him contradictory to talk of a German Empire overseas when the German Empire at home had not yet been firmly established. Most German statesmen supported the chancellor. As late as 1871 Bismarck told the Reichstag that Germany wanted no colonies; in the absence of a navy they would only

be a source of weakness. In 1878 the commander of the *Ariadne* annexed New Britain, but his action was repudiated by Bismarck, who also in 1880 rejected a scheme for colonizing New Guinea which was put to him by a deputation of influential Berlin bankers and merchants. Soon afterwards, however, a dispute with Britain over the Fiji Islands, and the annexation by other Powers of great tracts in Africa, influenced Bismarck to reconsider proposals for overseas expansion.

In 1867 the New South Wales government had asked the colonial office to annex New Guinea, alleging 'the increasing traffic between Australia and the Indian Isles, by way of the Torres Straits, which makes the possession of New Guinea by the British Empire a matter of highest importance to Australian colonists.' The colonial office refused either to annex, or to protect voluntary settlers in, New Guinea. Nevertheless in 1877 the discovery of gold there caused a rush of colonists from Australia, and in April 1883, fearing German aggression, Thomas McIlwraith (then premier of Queensland) ordered the annexation of all New Guinea east of the Dutch boundary. This act and its results are discussed under PAPUA. In the end Germany annexed the north-eastern coast of New Guinea and the Bismarck Archipelago in November and December 1884, and on 6 November Commodore Erskine hoisted the British flag at Port Moresby. In 1886 a definite boundary was delimited between the German and the English 'spheres of influence.'

Having acquired her colonies, Germany determined to use them not as locations for her surplus population but as sources of raw material for her industries. On 17 May 1885 the New Guinea Company was formally empowered to administer the newly annexed territories in the western Pacific, and the Reichstag voted 180,000 marks for their protection. But the company failed hopelessly in its attempts to govern, and in 1889 the German government had to resume the fiscal administration; a second attempt by the company, made in 1892-8, was equally unsuccessful, and in 1899 it sold its rights to the German government for four million marks and became merely a privileged trading company. It had from the first lacked prestige, and the many changes in its staff worked against efficient administration and control of the native population. In the islands it did better than on the mainland, but even there it was weak and unrespected; punitive expeditions against the inland tribes resulted in reprisals that damaged both missionary and trading interests, and the several missionary bodies quarrelled with each other and with the company. On 1 April 1899 the government took over control and divided the protectorate into (*a*) Kaiser Wilhelms Land—the New Guinea mainland—with headquarters at Friedrich Wilhelmshafen and sub-stations at Morobe and Aitape (which they knew as Eitape); (*b*) the Bismarck Archipelago, with headquarters at Herbertshohe and sub-stations at Kavieng (Kawieng) and Namatanai; (*c*) the northern Solomons, with a sub-station at Kieta. In 1910 the Carolines, Pelews, Marianne, and Marshalls (including Nauru) were absorbed in the New Guinea Protectorate. Under German administration the protectorate was not a success. Certainly the economic development of the commercial companies progressed, but individual efforts were more or less stifled. Gold had been discovered in the Bismarcks, but other minerals remained unexploited. Towards the end of 1913, however, exploration was seriously undertaken, and scientific investigations were begun in preparation for a progressive policy. Just before the declaration of war in 1914 oil had been prospected for unsuccessfully. In its dealing with the native races the German government was forced to use 'pidgin-English,' as the natives learnt this far more quickly than they could German.

The governor was appointed by the Kaiser, with wide powers, and had no local councils to assist him. Three officials took part in the general administration, and two superior judges were in charge of the judicial department. A technical department supervised public works and instituted scientific researches. The Protectorate was divided into seven administrative districts under the control of magistrates, and a system of village constables (luluais) was initiated somewhat similar to that in force in Papua; to each district was allotted a detachment of native police (nearly 500 in all) under white officials. Until 1890 the Protectorate was under the control of the German foreign office, but was then transferred to the newly-established colonial department. In 1902 an honorary advisory council was superimposed on the department, but five years later control was transferred to a newly-created colonial office with large and independent powers.

The Military Occupation.—On 12 September, 1914 the Australian Naval and Military Expeditionary Force (see AUSTRALIAN IMPERIAL FORCE) captured Rabaul, and five days afterwards terms of capitulation were signed by Colonel Holmes and Herr Haber, the acting-governor of German New Guinea. Military resistance to the occupation was to cease throughout the Protectorate (i.e. in the northern island-groups—now held under mandate by Japan—as well as in the region south of the equator) but Germans might remain in charge of their businesses and plantations. Military detachments were despatched to out-stations. When Holmes returned to Australia, Commander S. A. Pethebridge was appointed military administrator; on his death in 1918 he was succeeded by Brigadier-general G. J. Johnston, and he in 1920 by Brigadier-general T. Griffiths. Griffiths was transferred to Nauru (q.v.) on 3 February 1921, and Brigadier-general E. A. Wisdom became administrator. After the capitulation many Germans remained in official positions, but were gradually replaced by Australians. During the military occupation, the jurisdiction of the district officers was analogous to that of the former German officials, and most of the German laws were still enforced; taxes on business, the native poll-tax, and the customs tariff were continued in a slightly altered form; and native regulations were issued, based on a draft which the Germans had intended bringing into force in 1915.

Under the terms of surrender the German civil officials were returned to Germany, and officers of the regular army sent to Australia as prisoners of war; of the other German colonists, many were deported for military reasons, and others left voluntarily. In 1920 an expropriation ordinance vested the properties of German companies or subjects in a public trustee, and in 1921 they were transferred to a custodian of expropriated properties. A board was appointed to manage them pending sale or valuation. In 1919 a royal commission enquired into the affairs of the territory; a minority report suggested either the amalgamation of the ter-

ritorial public service with that of Papua or at least the appointment of a single administrator, but the majority report, recommending a distinct government for the Territory, was adopted by the Commonwealth government.

The Mandate.—On 9 May 1921 the territory south of the equator came under the control of the Commonwealth by a mandate from the League of Nations. Under this instrument 'The Mandatory shall have full power of administration and legislation over the territory subject to the present mandate as an integral portion of the Commonwealth of Australia, and may apply the laws of the Commonwealth of Australia to the territory, subject to such local modifications as circumstances may require.' Slave-trading is prohibited; forced labour is allowable only for essential public works, and must be paid for. Traffic in arms and ammunition is to be regulated by the convention of September 1919. Natives may not be supplied with intoxicants. No military training may be carried on except for local defence and police. No naval or military bases may be established in the Territory. Any form of worship may be practised, and all missionaries who are nationals of any state that is a member of the League of Nations are free to travel or reside in the Territory. No alteration may be made in the mandate without the consent of the council of the League of Nations, to which an annual report must be made. Any dispute between the Mandatory and another member of the League of Nations shall be submitted to the permanent court of international justice, if it cannot be settled by negotiation.

General Wisdom, then military administrator, was made civil administrator of the Territory. The administrator, who has no assistant legislature, is appointed by the Commonwealth; among the administrative departments are included the central court judges and the magistrates (district officers). The territory is divided into 11 districts, each in charge of a district officer, and some of them subdivided under deputy district officers. The districts are: Rabaul, Talasea, and Gasamata, in New Britain; Kavieng and Namatanai, in New Hanover and New Ireland; Manus, including the Admiraltys and the adjacent islands; Kieta, in the northern Solomons; and Morobe, Madang, Sepik, and Aitape on the mainland. A force of 500 native police is distributed among the districts to keep them under control and open up new country. The German system of luluais is continued. No legislative act of the Commonwealth has force in the Territory unless it is expressly so stated in the act. The governor-general has power to make ordinances having force of law in the Territory.

The expropriation board has gradually taken over German businesses and plantations, and repatriated most German civilians. In 1925 a few properties still remained unvalued. Except those to be resumed for administrative purposes, all will be offered for public sale by tender, and up to June 1926 130 lots had been sold, realizing £474,921—the official valuation was £397,159. Many returned soldiers who had been engaged on plantations as members of the board were among the successful tenderers. The sale marks a distinct advance in the economic progress of the Territory. As soon as the residue of the properties is sold the expropriation board will cease to function. In 1925 the federal parliament decided to appoint an advisory council to assist the administrator in his duties. The council embodies the directors of health and agriculture, the commissioner for native affairs, the government secretary, and the treasurer, and has power to propose new ordinances and recommend alterations and additions to the old.

Shipping.—The German Protectorate was well served by steamers. The Norddeutscher Lloyd ran monthly steamers between Hong Kong and Sydney, calling at Aitape, Madang, Rabaul, and Herbertshohe, as well as a direct service between Singapore and the main ports of the Territory. Smaller vessels plied between the plantations. Another shipping company—the Jaluit Gesellschaft—maintained a monthly service between Jabor (in the Marshalls) and Sydney, via Rabaul. The Mandated Territory is served by a single three-weekly service of steamers from Sydney and by 'tramp' steamers when sufficient cargo offers. Up to 1925 the Commonwealth navigation act applied to the Territory, but in that year its restrictions on territorial trade were cancelled.

Statistical.—In 1913 the exports of agricultural and marine products, feathers, and other minor commodities, amounted to £393,404. In 1924-5 the amount was £858,990, although bird-of-paradise feathers, which before the war accounted for many thousands of pounds, had become a prohibited export. The increase over 1913 is entirely due to copra—rubber, sisal hemp, cocoa-beans, bêche-de-mer, and ivory nuts all showing a decrease. In 1924-5 the territorial revenue was £242,775 and the expenditure £250,902; the revenue was derived chiefly from taxes and the customs tariff. The imports, including tobacco (over £43,000 worth), textiles, agricultural products, groceries, metals, and machinery, amounted in all to £537,940—a decrease of £30,821 on the previous year; the exports showed an increase of £87,643. At 30 June 1925 the native population in areas under complete control or government influence was 257,551, and the estimated population of areas patrolled but not under complete control 121,150. The white population was 1688 and Asiatics 1357.

Missions.—Six mission societies are established in the Territory. The (Catholic) Mission of the Most Sacred Heart of Jesus, with a staff of 105 Europeans, operates at Rabaul, Manus, and in New Ireland. At Madang is the Holy Ghost (Catholic) Mission, with a staff of 46. Twelve members of the Lutheran Mission are stationed at Morobe, Aitape, and Madang; the Methodist Missionary Society, with a staff of 18 Europeans, has stations at Rabaul and in Talasea, and New Ireland. The Marist Mission Society has 26 Europeans working in the Solomons, and the Liebenzeller Mission has a representative in Manus.

Relations with the Natives.—During the regime of the New Guinea Company and the early years of direct German administration, the policy was primarily to use the country and its aboriginal inhabitants for the benefit of Germany. As the *Kamerun Post* of 2 May 1914 said:—'Of what use is the native to us if he does not want work?' A poll-tax was levied to compel natives to go to work; but, rather than do so on European-owned plantations, the native preferred to sell his own produce, or to work for a coloured planter just long enough to earn the amount of the tax. Native labourers were therefore indentured from a few of the neighbouring islands and from the Solomons and Java, Asiatics being introduced as overseers.

Under this policy the economic development of the Territory had not progressed as far as it should, considering the amount of money that had been invested. In 1912 schemes were suggested for training the aboriginal inhabitants in skilled work, so as gradually to replace the Asiatics, but by 1914 these schemes were still more or less on paper, and little practical work had been done. Native youths, certainly, had been instructed by Malays in rubber-growing, with the intention of gradually producing a large crop of native-grown rubber, the price for which was fixed and guaranteed, so that the native should not be exploited by white traders. But in the government's dealings with natives the economical side was nearly always considered and the ethical seldom. The labourer's health, for instance, received attention, and a fine tropical medical service was inaugurated. Birching, caning, fining, or imprisonment of native labourers could be inflicted by European planters under authority from the German governor. These punishments have now been wholly transferred to the magisterial officers, and the birching and caning of natives is forbidden.

The native at his present stage is not as a rule capable of sustained effort, and must be taught and encouraged to plant, reap, and market his own goods; the Territory could thus be developed economically, without the wastage of European lives and energy on large plantations, and the tropical producer would deal with the consumer through the European merchant, as is done in the West African colonies. Since the mandate the administration has inaugurated schemes for general and technical education; an elementary school has been established for native children, and a technical school for training the more intelligent natives in handicrafts and domestic economy. A medical staff is engaged in stamping out the diseases introduced by European and Asiatic colonists, as well as the many local diseases.

Anthropology.—There is still a vast field for the anthropologist in the Mandated Territory, and the newly-created position of government anthropologist will be of great value to science. With our present knowledge not more than three main groups—negrito, Papuan, and Papuo-Melanesian—can be distinguished among the natives. The negrito is woolly-haired, brown-skinned, of medium to small stature (sometimes a pygmy), brachycephalic, with a platyrrhine nose, and inhabits the head-waters of the Sepik. Schultze has collected evidence of a pygmy element in the south-western ranges near the Papuan border. A less pure breed of negrito (with Papuan admixture) occurs in the Rawlinson and Sattelberg ranges on the Huon peninsula. Regarding the customs and social organization of the Sepik negrito little is known, but he seems to resemble the negritos of north-western Papua (q.v.).

More field-work has been done among the Papuo-negrito (Kai) tribes of the Huon peninsula. They are of mixed pygmy and Papuan descent, and speak a Papuan language. They have animistic beliefs, and at their circumcision festivals (which are held in a long tapering hut in the forest away from the village) bull-roarers are used. To assist the growth of crops religious games are played. According to Keysser, the soul of a person remains alive after death and resembles the living in shape, but can be degraded by ghost-sorcerers into an animal and again into an insect, with the death of which the soul-stuff disappears. The cuirass commonly associated with the negrito in the north-west of Papua has been found near the Bewani ranges and near the coast east of Humboldt Bay, but at present no negrito element is known in these regions.

The Papuan is black and woolly-haired, with a dark brown skin, dolichocephalic head, and long, broad nose—sometimes very prominent and convex. His main habitat is the interior of the mainland; he is also found near the coast at Monumbo (close to Potsdam harbour), along the Keram (the most easterly tributary of the Sepik), at Bogadjim near Astrolabe Bay, and at Sialum and Kwamkwam near Cape King William. He speaks a Papuan language, uses bull-roarers(at least in the district between Astrolabe Bay and the Huon Gulf), and prepares great ceremonial paraphernalia in connection with initiation and other festivals, more especially among the Sepik River tribes. In many inland districts head-hunting is practised, and there seems to be a skull-cult. Between the Sepik and Aitape the spear and spear-thrower are used; coiled pottery is manufactured along the middle Sepik. Huge carvings of the human form are prepared, but merely as a representation of the dead and not in connection with ancestor-worship.

The Papuo-Melanesian's hair is woolly, sometimes curly or even wavy. The colour of the skin varies from dark chocolate to copper. The head is usually dolichocephalic, though here and there the brachycephalic type is found. The nose is broad and often straight, but as a rule smaller than that of the true Papuan. Papuo-Melanesians are found on the mainland coast (especially round Astrolabe Bay and on the north coast) and inland up the Markham River. Among the islands of the Bismarck Archipelago the natives tend towards a purer Melanesian type as the distance from the New Guinea mainland increases. They show, however, many analogies to the Massim farther south, and are therefore included among Papuo-Melanesians until further field-work has allotted them their proper group. On the Admiralty Islands there seem to be three distinct groups of people—Manus, Matankor, and Usiai. The Manus live in houses on the sea, use canoes and large fishing-nets, understand the movements of the moon and stars, and chew betel-nut; they are head-hunters, and have probably a large amount of Papuan admixture. The Matankor build their houses on the shore and neither understand the moon and stars nor chew betel-nut. The Usiai are bush tribes who cultivate gardens; they are cannibals and snake-eaters, and are the most primitive in culture. Among their tribes many different dialects are spoken. In some parts of the Admiralty group kava-drinking is practised, and the slit-gong is used. Bows and arrows are now rare except in hunting, their place having been taken by spears and lances. These people appear to be totemistic.

South of the Gazelle peninsula in New Britain, the Sulka, Menga, and Tumiup tribes speak a non-Melanesian language. Among them are found initiation ceremonies, the practice of circumcision, boring the nose, blackening the teeth, and the chewing of betel-nut. Little is known of their social organization. The dead are buried in a house in a sitting position, and care is taken to protect the corpse from contact with the earth.

The Baining tribes of the Gazelle peninsula, who also speak a non-Melanesian language, are semi-nomadic agriculturists. There seems to be

no system of chieftainship, and—as is not the case with other tribes of the archipelago—the men can choose their own wives. The dead are interred, but the grave is sometimes left without any covering of earth.

In northern New Ireland and in New Hanover there is a system of totemic clanship. The people manufacture (and use in certain ceremonies) complicated masks and carvings. There are traces of an ancestor-cult, but no secret societies. Though platform-burial is still practised, the usual mode of the disposal of the dead is by cremation.

The next culture-district comprises southern New Ireland, the Duke of York group, the eastern coast of the Gazelle peninsula, and the western part of the north coast of New Britain. Here the tribes are divided into two exogamous moieties, in some parts associated with legendary heroes, in others with birds, insects, or even coconuts. Descent is matrilineal—except in the west of New Britain, where there is evidence of a change from matrilineal to patrilineal. Connected with the social groups are traces of totemism. In the Gazelle peninsula rank depends on riches (in the form of shell-money); in New Ireland and western New Britain there is a system of hereditary chieftainship, with succession in the male line. Of the two secret societies operating in this culture-district, the Ingiet is the older, but the more recent Dukduk is more prominent in public life. The former has many branches, but admission into one of them carries with it membership of the whole organization. Initiation is made by payment of shell-money, and is accompanied by a form of seclusion; at the end of the seclusion-period the initiate is presented with a small gift of shell-money by all present at the ceremony, the implication being that he has died and come to life once more. Only initiates may see certain stone images representing dead members of the society; these images may take human or animal form, and some are merely manufactured inanimate objects in which the ghost of the maker is supposed to reside. Celebrations of the Ingiet ritual are held at places lying successively from west to east in New Britain, Dukduk celebrations move similarly from east to west. The principal feature of the Ingiet society is the practice of magic, both beneficent and malignant; special initiation is required before members can practise malignant magic. In one branch of this society the annual initiation ceremony includes the erection of a strange pyramidal tower-like structure on the main branches of a tree. The Dukduk society initiates only male members, and at its ceremonies masks of two kinds—dukduk and tubuan—are used; the tubuan is presumed to remain alive throughout the year, the dukduk only for some months. The society seems to have a skull-cult, and the wearer of the dukduk uses a special secret cry. The ownership of a tubuan mask brings importance to the owner, who may protect private property by a taboo sign. During the society's dances bull-roarers are swung to warn off the uninitiated. In the Bismarck Archipelago the Dukduk cult seems to be associated with the solstice, and Rivers supposes it to be connected with some hidden cult of the sun. The shell-money used for initiations (obtained from *Nassa callosa* var. *camelus*) is also used in the transactions of everyday life.

In this culture-district interment is the usual way of disposing of a dead body, but in some areas corpses are thrown into the sea; platform-burial is also practised. The decorative art is based on spiral and other curvilinear designs. In the northern Solomons little is known about the bush and the mountain tribes. The coastal tribes have a Melanesian culture. In Bougainville cremation is practised, and there is an archaic system of relationship. Secret societies similar to the Dukduk have great power, and the bull-roarer is associated with them. Bird-totemism is found in this district; there is a belief in animal ghosts, and there seems to be a tree-cult, but little is known of it. Descent is matrilineal. The language is Melanesian. See MELANESIA, MIGRATIONS IN.

Of books dealing with the Mandated Territory the greater number are (as might be expected) German; the following are worth special study—Otto Finsch's *Neu-Guinea* (1865), C. Hager's *Kaiser Wilhelmsland und der Bismarckarchipel* (1886), R. Parkinson's *Im Bismarckarchipel* (1887), B. Hagen's *Unter den Papuas* and M. Krieger's *Neu-Guinea* (1899), H. Blum's *Neu-Guinea und der Bismarckarchipel* (1900), R. Parkinson's *Dreissig Jahre in der Südsee* (1909), R. Neuhauss's *Deutsch Neu-Guinea* (1911), and O. Reche's *Der Kaiserin Augusta Fluss* (1913). Among English books the *Autobiography* of George Brown, q.v. (1908), Evan Stanley's *Salient Geological Features of the Mandated Territory*, and the *Report* of the royal commission of 1919 should be consulted.

L.A.

Manganese. See MINERALOGY.

Mangrove, a name usually applied to species of Rhizophoraceae which thrive in saltwater marshes; it is also used for species of *Avicennia* (family Verbenaceae) and *Aegiceras* (family Myrsinaceae) from similar localities. For the milky mangrove see EXCAECARIA.

Rhizophoraceae are a small, almost entirely tropical family of trees and shrubs with opposite, leathery leaves and flowers in small clusters (occasionally solitary), found in Asia, Africa, and America. Several Asiatic genera are indigenous to Australia. Calyx-lobes 4-12; petals alternating with sepals; stamens inserted with the petals at the base of the free part of the calyx; fruit enclosed in the calyx-tube. The genera *Rhizophora, Bruguiera* and *Ceriops* are tropical, strand, or salt-marsh plants, whose seeds are in an advanced stage of germination (vivipary) when they fall from the trees. The elongated embryo becomes detached and falls, its lower end boring into the mud; after a few days the bud at the upper end—previously covered by the bell-shaped seed-leaf—is disclosed. Its four small green scales do not greatly enlarge, but the shoot arising from it develops the large foliage-leaves. Roots also arise from the lower end, though a true tap-root is not formed. The seedlings are capable of floating in salt water for a long time without injury, and are frequently carried long distances by ocean currents. This group of mangroves develops stilt-roots on the lower part of the stem, thus raising the trees to a considerable height above the mud.

Rhizophora includes three species, two in Asia and one in America. The calyx is divided, nearly to the base, into 4 segments; petals 4, entire; stamens 8-12, with short stalks; fruit oval or conical. *R. mucronata*, the only species indigenous to Australia, is the common tropical mangrove. Its bark is used in India for tanning; the Australian trees also contain tannin, but all mangroves increase in tannin-content as their habitat approaches the equator. Fijians use the blood-red sap for dying their hair, and (when mixed with the sap of *Hibiscus moschatus*) for painting crockery. The aerial roots are

elastic, and afford good material for bows. *Bruguiera* is widespread along tropical sea-coasts in the Old World. The calyx-tube is bell-shaped, with 10-15 narrow segments; fruit top-shaped, crowned by the persistent calyx-lobes. *B. Rheedii* (Red Mangrove, 'Kowinka' of the Queensland aborigines) has a hard durable timber, yellow or reddish-brown, close-grained and coarsely fibrous, useful for axe- and pick-handles. It is used in India for house-posts and furniture, and the bark for tanning. *Ceriops* is a small genus; the only indigenous representative, *C. Candolleana*, is a small tree or tall shrub with dense clusters of flowers. Its timber is used in India for the knees of boats and house-posts, and the bark as a litter for cattle.

Carallia, extending over tropical Asia, is not a strictly coastal genus, and its succulent globular fruit does not show vivipary. The single indigenous species, *C. integerrima*, is a small tree with diminutive flowers, 3-5 together on short branches. The wood is light-coloured, darkening prettily towards the heartwood, close in the grain and easy to work; it takes a good polish. It is used in Burma for furniture and building purposes.

Avicennia, a genus of the family Verbenaceae, contains a few species widely dispersed over the warmer regions of the globe; the single species indigenous to Australia is the commonest. The calyx is divided to the base in 5 distinct segments; corolla-tube short and broad, with 4 nearly equal spreading lobes; stamens 4, inserted in the throat of the corolla; fruit a compressed capsule; seed solitary, erect. *A. officinalis* (White or Gray Mangrove) is an umbrageous tree, always found near the sea. It forms forests in the mud-flats bordering salt-marshes, or lines the banks of tidal rivers, and is specially equipped for existence in this environment. The leaves have a varnished coat for protection against the sun's rays; to breathe, the tree has developed erect asparagus-like structures (pneumatophores or breathing-roots, found also in other mangroves) that rise from the horizontal roots, the marsh mud being imperfectly aerated. These organs project above the water at low tide and secure the necessary supply of oxygen. The fruits are adapted for distribution by currents, and, in a more or less advanced stage of germination, are borne to adjacent mud-banks where they quickly become established. The timber, on account of its toughness and interlocked tissue, is valuable for stonemasons' mallets; it is also used for knees of boats and bullock-yokes.

Aegiceras (family Myrsinaceae) is limited to a single species, spread over the sea-coasts of tropical Asia and Malaysia. *A. majus* (Black or River Mangrove) is a large shrub found in salt-marshes and tidal rivers along the Australian coast from New South Wales to northern Australia. It has fragrant flowers in clusters, which develop into bunches of horn-shaped fruits. Like some other mangroves, it is useful for consolidating the banks of saltwater rivers.

Manners-Sutton, Sir J. H. T. See Canterbury, Viscount.

Manning, John Edye (1807-1889), elder brother of Sir W. M. Manning (q.v.) was born at Bristol and migrated to New South Wales in the thirties with his father, who was appointed registrar of the supreme court. Having a gift for engineering, the son devoted himself to marine architecture, from 1835 onwards ran a small steam ferry (the *Experiment*) to Parramatta, invented in 1836 machinery for lifting engines from wrecks exposed to the sea, in the same year ran a locally built and engined steamer to the Hunter, in 1842 added the *Emu* to his Parramatta service, and in 1844 founded the Parramatta Steamboat Company. A few years later he founded the Illawarra Steam Navigation Company, and embraced the Clarence River district in his scheme of coastal navigation. Many of the vessels employed in these services were partly designed by him, and nearly all—whether built locally or in England—he supervised in the building. He died at Wentworth Falls in New South Wales on 24 February 1889.

Manning, Sir William Montagu (1811-1895), son of John Edye Manning of Bristol, was born at Alphington in Devon on 20 June 1811, educated at University College, London, and admitted to the English bar from Lincoln's Inn in November 1832. In 1837 he migrated to New South Wales to become chairman of quarter sessions. On 1 September 1844 he was made solicitor-general, and held the post until the advent of responsible government in 1856, with an interval (12 January 1848 to 19 November 1849) during which he acted as a judge in the absence of Judge Therry. On 13 October 1851 he was appointed to the legislative council, and took a considerable part in moulding the constitution bill of 1853. On 9 April 1856 he was elected by the south riding of county Cumberland to the new assembly, and became attorney-general in the Donaldson (June-August 1856) and Parker (October 1856 to May 1858) ministries, but retired on 25 May 1857 on account of ill-health; he took the same office in the Forster ministry of 1859-60, but held it only a few weeks and retired before he could secure a seat in the house. On 24 June 1861 he was nominated to the council, and remained a member till 1876, being attorney-general in the Robertson and Cowper ministries (31 October 1868 to 15 December 1870). On 28 April 1876 he was made a judge of the supreme court and primary judge in equity. Retiring on 17 October 1887, he devoted the rest of his life mainly to the university of Sydney—of which he had been made chancellor in 1878—and died on 27 February 1895. (Kt.Bach., 1858.)

Man-o'-war Bird. See Frigate-birds.

Mansfield, Ralph (1799-1880), born at Liverpool, England on 12 March 1799, was ordained a minister of the Wesleyan Church in 1820 and sent to Sydney to assist Samuel Leigh (q.v.). He ministered at Sydney (1820-2), at Parramatta and Windsor (1823), at Hobart (1824-5), and at Sydney again till 1828, when, owing to misunderstandings with the executive committee in London, he retired from ministerial work while retaining the title of 'Reverend.' He then entered on a journalistic career—no strange thing for him, since in 1821-2 he had joined Carvosso and Lawry in conducting the *Australian Magazine*. From 1829 to 1832 he edited the *Sydney Gazette;* in 1833 he started the *New South Wales Magazine*, with the eccentric Dr. John Lhotsky as co-editor; he contributed many articles both to Dr. Lang's *Colonist* and to the *Sydney Morning Herald*. In the same year he became a bookseller, specializing in second-hand medical works and serial romances, and binding books as a side-line; but he sold the business in 1834 to G. W. Evans (q.v.). In 1836 he advo-

cated the lighting of the town with gas, formed a company for the purpose, and was its secretary until his death in June 1880. In 1841 and 1846 he published 'analytical views' of the census taken in those years, the first purely statistical work published in Australia, and a distinctly valuable ancestor of the *Year Books* of recent times. J.C.

Mantis, vernacular name of insects of the family Mantidae, belonging to the order Orthoptera. The true Praying Mantis (*Mantis religiosa*) is not found in Australia, where the order is represented by about 80 species, some of them large and handsome. The common green species is *Orthodera ministralis*; a large, short-winged

Archimantis latistylus.

mantis (*Archimantis latistylus*) and the handsome, elongate *Tenodera australasiae* are also well known, and the small, active, tree-haunting species of the genus *Paroxypilus* and its allies (belonging to the sub-family Perlomantinae) are not uncommon. The remarkable front-legs of these insects are specially constructed for holding their prey, the family being carnivorous and highly voracious. Sharp (*Cambridge Natural History*) records from Victoria the utilization of this voracity in the young mantis for clearing a room of flies by placing them on the window-blinds of houses. See ORTHOPTERA. R.J.T.

Manucode. See RIFLE-BIRDS AND TRUMPET-BIRD.

Manufactures. During the early years of settlement supplies from England were received irregularly and at long intervals; it was necessary, therefore, for the colony to be self-supporting as far as possible. In addition to industries associated with agriculture (e.g. flour-milling) attention was given to the manufacture of cloth. In 1790 Andrew Hume (father of Hamilton Hume, q.v.), an expert in the manufacture of flax, was appointed superintendent of convicts on Norfolk Island, and began experiments with the local flax-plant; early in 1791 two pieces of indifferent cloth were made, but the experiment was not continued. European flax was then planted in the neighbourhood of Sydney, looms sent out by the British authorities were set up at Parramatta under the supervision of an Irish convict, and by March 1802 646 yards of linen and 306 yards of woollen blanketing had been made; by March 1804 sufficient sacking was being made to meet agricultural requirements, and 50 yards of linen were bartered weekly by the commissariat; only coarse wool could be procured, the better grades being bought up by Yorkshire. The government cloth-factory at Parramatta was maintained for the greater part of the convict era, but the manufacture of linen was gradually abandoned. Macquarie encouraged private enterprise, and during his administration Simeon Lord (q.v.) initiated the manufacture of cloth at Botany; he also planned to form a settlement in New Zealand to procure supplies of flax, but this venture was a failure. Early in the forties Sir John Jamison (q.v.) erected cloth-mills near Penrith, but the development of the wool trade ensured a regular shipping service and cheap supplies of cloth from overseas.

The first ale brewed in Australia was made by James Squire at Kissing Point on the Parramatta River in 1795, but he did not work continuously, though in 1819 he described himself as a licensed brewer of many years' standing. King in September 1804 established a government brewery at Parramatta, but in March 1806 leased it to Thomas Rushton and in May licensed Andrew Thompson to brew beer for settlers on the Hawkesbury. Maize was the grain generally used. In March King also leased to Michael Burn the salt-pans at Rushcutter's Bay, but maintained those at Newcastle under government control, and a little later established fresh pans at Rose Bay. In 1807 table-salt was prepared at John Blaxland's private pans on the Parramatta and at Newcastle, but salt for curing was mainly imported—though Bligh declared that the Rose Bay salt was 'now produced in tolerable perfection.' Under Macquarie and his immediate successors manufactures lagged, the attention of both governor and colonists being concentrated on the spread of settlement and the production of wool and wheat. Bigge discouraged manufactures, since in his opinion convict labour could be much more usefully employed by settlers in farming and wool-growing. The only factory of which he took any notice was Lord's, where cloth, hats, blankets, and stockings were being made—'the Colonial-made goods, however, are still so costly that it is more economical to buy imported wares.' Nevertheless before the thirties other articles were being manufactured on a small scale—good soap made with soda from Botany Bay mangroves; enough candles to supply the local market; tanned leather; tobacco (q.v.); cheese 'of the best quality;' and coarse earthenware, the best-known potteries being those of James King (q.v.) of Irrawang. There were also nascent shipbuilding and wine-making industries, which are separately described. But capital was better employed in pastoral enterprises and before the gold discoveries manufactures were few and unimportant. In 1848 the number of industrial establishments in Australia was only 479, and of persons employed under 2000; the most numerous of any one class were flour-mills, of which there were 220. Next in number were establishments for the treatment of skins and hides, followed in the order named by breweries and distilleries, soap and candle works, iron foundries, brick-works and potteries, and boat-building. Of the 479 establishments 272 were in what is now New South Wales, 41 in the Port Phillip district (now Victoria), 99 in Tasmania, and 67 in South Australia. The average number of employees was less than five.

The discovery of gold effected a revolution in all industrial relations. Many migrants who arrived during the gold-rush, failing for one reason or another to meet with early success on the goldfields, settled down to the trades or occupations they had previously followed. At a later stage the depletion of the richer alluvial deposits threw many diggers out of employment, and population began to concentrate in a few of the larger towns, establishing incipient artisan communities. The manufacturing industries therefore owe their development very largely to the population which was attracted to the country by the gold-discoveries.

The construction of the first railways (1854) and the re-establishment of regular steamship communication with Europe (1856) helped to encourage this nascent industrial activity. New South Wales and Victoria, which in 1855 received the benefits of responsible government, soon turned their attention to the settlement of an agricultural population on the land, thus increasing the measure of primary production and promoting the development of manufactures. Since the inauguration of the Commonwealth, the throwing open of all Australian markets to the produce of each State has facilitated the internal distribution of Australian products; there has been very substantial development in manufacturing industries, and many of them are now established on a secure basis. The development since 1911 is indicated by the following figures:—

Development of Manufacturing Industries in Australia, 1911 and 1924.

	1911	1924
Number of factories ..	14,445	20,189
Number of employees .	311,772	429,990
Wages paid	£27,532,000	£77,278,000
Value of fuel used ...	£2,753,000	£10,297,000
Value of materials used	£79,041,000	£197,039,000
Value of output	£133,186,000	£348,578,000
Value added in process of manufacture	£54,145,000	£141,241,000
Value of land and buildings	£32,499,000	£82,562,000
Value of plant and machinery	£31,599,000	£99,553,000

The value added in process of manufacture best represents the net wealth created by manufacturing operations. The increase in this value since 1911 is equivalent to an average annual increase of slightly over 20 per cent.

The greatest development in manufactures has naturally taken place in the more populous States. In 1924 about 73 per cent both of the factories and of the employees were in New South Wales or Victoria:—

FACTORIES AND EMPLOYEES IN EACH STATE, 1881 TO 1924.

Year.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Commonwealth.
			Number of Factories.				
1881	2,961	2,488	571	823	...	...	...
1901	3,367	3,249	2,110	1,335	662	420	11,143
1921	5,837	6,532	1,795	1,438	895	616	17,113
1924	7,321	7,289	1,912	1,698	1,188	781	20,189
			Number of Employees.				
1881	31,191	43,209	...	10,995	...	...	...
1901	66,135	66,529	26,172	19,283	12,198	7,466	197,783
1921	145,011	140,743	43,196	30,430	17,034	10,225	386,639
1924	159,674	156,162	44,948	37,275	19,712	12,219	429,990

The next table summarizes the official statistics for 1923-4 for the various groups of industries. It will be seen that as regards net wealth created (i.e., value added in process of manufacture) the most important industries are those connected with metal-works and machinery.

The largest number of employees was engaged in the clothing and textile industries, which occupied 23.4 per cent of the whole number. Classes VI, VII, and VIII comprise the industries in which female labour is largely employed.

The maximum amount of salaries and wages was paid in Class V—24.4 per cent of the total amount.

COMMONWEALTH MANUFACTORIES, 1923-4.

Class of Industry.	Establishments.	Hands Employed.	Salaries and Wages Paid.	Value of Land and Buildings Used.	Value of Plant and Machinery.	Value of Raw Material, Fuel, and Light Used.	Value of Output.	Value added in Process of Manufacture.
	No.	No.	£	£	£	£	£	£
I. Treating raw material, product of agriculture and pastoral pursuits.	799	10,342	1,966,000	2,085,000	2,171,000	15,558,000	19,181,000	3,623,000
II. Treating oils and fats (animal, vegetable, &c.)	99	3,424	606,000	953,000	1,147,000	3,035,000	4,647,000	1,612,000
III. Processes in stone, clay, glass, &c....	845	20,256	4,306,000	3,592,000	5,463,000	4,401,000	12,155,000	7,754,000
IV. Working in wood	2,497	36,319	6,997,000	4,101,000	5,291,000	11,048,000	22,001,000	10,953,000
V. Metal-works, machinery, &c ...	2,575	88,213	18,868,000	12,998,000	18,410,000	40,941,000	69,982,000	29,41,000
VI. Connected with food and drink ...	2,702	61,550	11,087,000	18,278,000	20,949,000	78,094,000	106,551,000	28,457,000
VII. Clothing and textile fabrics ...	4,408	100,850	12,428,000	13,248,000	6,722,000	24,016,000	44,420,000	20,404,000
VIII. Books, paper, printing, and engraving	1,423	32,659	6,346,000	6,748,000	6,707,000	6,906,000	18,495,000	11,589,000
IX. Musical instruments, &c.	50	1,357	298,000	254,000	94,000	396,000	848,000	452,000
X. Arms and explosives	15	803	188,000	298,000	253,000	212,000	491,000	279,000
XI. Vehicles and fittings, saddlery, harness, &c.	2,189	22,490	3,902,000	5,167,000	1,278,000	4,195,000	10,414,000	6,219,000
XII. Ship and boat-building and repairing	88	5,794	1,443,000	1,790,000	2,045,000	701,000	2,332,000	1,631,000
XIII. Furniture, bedding, and upholstery	1,160	15,230	2,540,000	2,499,000	674,000	4,044,000	7,970,000	3,926,000
XIV. Drugs, chemicals, and by-products.	323	7,215	1,378,000	2,352,000	2,094,000	5,036,000	8,684,000	3,648,000
XV. Surgical and other scientific instruments	84	608	104,000	221,000	46,000	102,000	287,000	185,000
XVI. Jewellery, time-pieces, and plated ware	258	2,447	421,000	621,000	147,000	461,000	1,138,000	677,000
XVII. Heat, light, and power	435	12,967	3,229,000	6,103,000	25,030,000	5,780,000	14,750,000	8,970,000
XVIII. Leatherware, n.e.i.	126	2,576	382,000	394,000	107,000	830,000	1,470,000	640,000
XIX. Minor wares, n.e.i.	113	4,390	789,000	860,000	925,000	1,580,000	2,761,000	1,181,000
Total	20,189	429,990	77,278,000	82,562,000	99,553,000	207,336,000	348,577,000	141,241,000

In the next table particulars are given of the average annual earnings per employee in 1911 and 1924. In considering this table regard should be paid to the nature of certain industries which are carried on to a greater extent in some States than in others. In Victoria, for instance, there is a large number of factories and hands employed in the clothing industries, and in that class the average wages are low, a great many women and children being employed.

The average annual earnings per employee increased from £77 in 1907 to £92 in 1911, £111 in 1916, £169 in 1921, and £188 in 1924.

MANUFACTURING INDUSTRIES—AVERAGE ANNUAL EARNINGS PER EMPLOYEE, 1911 AND 1924.

Year	New South Wales.	Victoria.	Q'land	South Australia.	West Australia.	Tasmania.	Commonwealth
	£	£	£	£	£	£	£
1911	96·3	83·4	87·1	99·6	129·8	84·4	92·2
1924	194·1	184·8	179·2	188·2	190·2	163·6	187·6

The next table shows the value of production in manufacturing industries in each State—that is, the difference between the total value of the output and the value of the raw material used. In this respect New South Wales and Victoria far outstrip the other States, the value in New South Wales being 39.4 per cent of the total for the Commonwealth, and the value in Victoria 34.7 per cent of the total. Queensland's production amounted to 11.3 per cent, South Australia's to 7.9, Western Australia's to 4.0, and Tasmania's to 2.7. Comparing the third column of the next table with the last line of the previous one, it is seen that on the average wages accounted for nearly £188, or 57.3 per cent of the 'value of production per employee' (£328). This leaves approximately £140 per employee for profit, interest on capital, depreciation, fuel and light, and all other charges.

The value of production per employee increased from £173 in 1911 to £286 in 1921, and £328 in 1924—an increase of nearly 90 per cent between 1911 and 1924. But the increase in average annual earnings between 1911 and 1924 was approximately 103 per cent, which is considerably higher than the rate of increase in value of production per employee over the same period.

MANUFACTURING INDUSTRIES—VALUE OF PRODUCTION, 1924.

State.	Total.	Per Employee.	Per head of Mean Population.
	£	£	£
New South Wales ...	55,661,000	349	25
Victoria	48,901,000	313	30
Queensland ...	16,049,000	357	20
South Australia ...	11,179,000	300	21
Western Australia ...	5,698,000	289	16
Tasmania	3,754,000	307	17
Commonwealth...	141,242,000	328	25

As the total value of production of manufacturing industries in 1924 was £348,577,000, there remained—after payment of £197,039,000 for raw material, of £10,297,000 for fuel and light, and of £77,278,000 for salaries and wages—£63,963,000 to provide for all other expenditure, depreciation, interest, and profits. The figures, with the corresponding percentages, are shown in the following table:—

MANUFACTURING INDUSTRIES—DISTRIBUTION OF COSTS, 1924.

Particulars.	Total Amount.	Per cent on Total Value of Output.
	£	Per cent
Raw materials used	197,039,000	56·53
Fuel and light	10,297,000	2·95
Salaries and wages	77,278,000	22·17
All other expenditure, interest, and profits	63,963,000	18·35
Total value of output ...	348,577,000	100·00

From about 1911 to 1921 there was a substantial diminution in the percentage available for profits, interest and other charges; in 1911 the percentage was 17.9, by 1917 it had decreased to 16.2, and by 1921 to 14.66. During the next three years, however, the percentage increased again, and in 1924 was 18.35.

Out of 429,990 hands employed in manufactories in 1924, 107,033 were females and 322,957 males. In New South Wales the ratio of females to males was about one to seven in the year 1886; in 1891 one to six; in 1903 it became about one to four; and is now less than one to three. In Victoria the ratio of females to males during 1886 was about one to five; five years later (1891) it was somewhat less, but in 1896 had increased to about one to three, and in 1924 was nearly one to two. In the remaining States the ratios during 1924 were—Queensland and South Australia one to four, Western Australia and Tasmania about one to five. The proportion for the whole Commonwealth was one to three. The development of the clothing and textile industries is one of the main causes of increase in female employment. Certain trades are specifically considered women's trades—clothing and textile trades, preparation of food, book-binding, and lighter work connected with the drug trade. A considerable number of women are also employed as clerks and typists in factories.

In statistical compilations the term 'child' denotes any person under 16 years of age. Since 1907 there has been in every State an increase in the average number of children employed, and the total number of children employed in factories increased from 14,622 in 1907 to 21,209 in 1924. In each State, however, a comparison between the number of child-workers and the total number of persons employed shows a fairly regular decrease in the percentage of child-labour. For the whole Commonwealth this percentage decreased from 5.9 per cent in 1907 to slightly under 5 in 1924. The number of male and female children employed in factories in each State in 1924 was:—New South Wales, 8166; Victoria, 7479; Queensland, 2208; South Australia, 1972; Western Australia, 730; and Tasmania, 654.

To make the above information more complete, it should be supplemented by details exhibiting the development of individual industries; it is not possible, within the limits of this article, to give anything like a detailed account of Aus-

tralia's manufacturing industries, but the following table shows in summarized and comparative form particulars for 1924 regarding industries of special importance:—

Class of Manufactory.	Factories.	Employees.	Value of Raw Materials and Fuel used.	Salaries and Wages.	Total Value of Output.
	No.	No.	£	£	£
Tanneries	166	4,845	3,720,000	965,000	5,476,000
Soap and candles	70	2,556	1,808,000	439,000	2,915,000
Agricultural Implements ...	160	5,584	1,506,000	1,126,000	3,132,000
Engineering works, &c.	1,343	33,052	14,072,000	6,949,000	24,151,000
Railway workshops, &c. ...	122	25,130	4,757,000	5,799,000	11,652,000
Smelting works, &c.	38	5,780	12,572,000	1,586,000	17,384,000
Bacon-curing	73	1,523	3,477,000	349,000	4,399,000
Butter, cheese, &c.	583	5,233	16,792,000	1,112,000	19,526,000
Ice and refrigerating, &c. ...	311	2,313	4,712,000	469,000	5,775,000
Jam and fruit preserving, &c. ...	175	6,600	3,002,000	885,000	4,722,000
Confectionery	258	8,724	3,445,000	2,263,000	6,163,000
Flour-mills	182	3,697	13,371,000	845,000	15,867,000
Sugar-mills	40	6,000	5,453,000	1,075,000	7,754,000
Breweries	57	3,854	2,985,000	1,063,000	6,887,000
Tobacco, cigars, and cigarettes ...	28	4,312	4,519,000	806,000	6,645,000
Woollen and tweed mills ...	47	7,532	2,952,000	1,770,000	4,864,000
Boots and shoes	1,030	21,464	4,900,000	3,295,000	9,899,000
Coach and waggon building ...	707	5,706	1,100,000	918,000	2,459,000
Furniture and cabinet-making ...	774	10,201	2,311,000	1,786,000	5,046,000
Electric light and power ...	288	5,488	2,279,000	1,424,000	7,213,000
Gasworks	121	5,481	2,329,000	1,386,000	5,647,000
Chemicals, drugs, and medicines	143	3,132	1,628,000	533,000	3,138,000

Tanneries.—Until recent years the production of the tanneries in Australia was confined to the coarser classes of leathers, but lately the tanning of the finer skins has been undertaken with satisfactory results. In 1924 the number of hides treated at Australian tanneries amounted to 1,574,000, and the quantity of bark used to 29,000 tons; nearly 52,000,000 lb. of leather, valued at £3,814,000, were produced, in addition to 3,613,000 lb. of basils valued at £377,528.

Soap and Candles.—These two industries are frequently carried on in the same establishments, the total value of the output from Commonwealth factories in 1924 being approximately £2,915,000. The tallow used in that year was 435,000 cwt., of alkali 141,000 cwt., and of coconut-oil 739,000 gallons. The soap manufactured amounted to 883,000 cwt., the candles to approximately 9¾ million lb.

Agricultural Implements.—The manufacture of agricultural implements is an important industry in Australia, and is of particular interest owing to the fact that it was one of the first industries to which the so-called 'new protection' (q.v.) system was sought to be applied. The articles manufactured include strippers, stripper-harvesters, stump-jumping and other ploughs, harrows, disk and other cultivators, winnowers, baggers, drills, and other implements. Several Australian makers have built up a considerable export trade. The stripper-harvester, which combines the stripper with a mechanism for winnowing and bagging grain, is an Australian invention (see McKAY, H. V. and RIDLEY, JOHN) and is exported to many countries.

Engineering Works.—This group includes a considerable variety of important industries, the progress of which during recent years has been rapid. In addition to engineering works which supply ordinary requirements, a number of establishments engage in the manufacture of special classes of machinery and materials—e.g. internal-combustion-engines, high-speed steam-engines, weldless steel tires, water-meters, weigh-bridges and weighing machinery, stamped metal work, tractors, power-plant transmission, steel castings, boiler-making, air compressors and mining plant, aluminium ware, refrigerating engines and ice-making machinery, copper tubes, cycles, and motor-cycles, art metal, axles, wheels, bolts and nuts. The manufacture of iron and steel is an industry which since the outbreak of war has made rapid progress, and has been the means of establishing many subsidiary industries, such as wire-drawing, nail-making, and the manufacture of railway rails and fishplates.

The manufacture of mining and smelting machinery is also an important section of the engineering industry. Much of it is of Australian invention, but some is manufactured under licence from holders of British and American patents.

Railway Workshops.—The railway workshops of Australia are chiefly State institutions. The extension of the railway and tramway systems, jointly with increased traffic, has greatly stimulated the manufacture of rolling-stock, etc., though during the war period the operations of these establishments were restricted on the score of economy. The value of the output increased from £5,037,000 in 1918 to £11,652,000 in 1924.

Smelting Works, etc.—This group includes establishments for metal-smelting, the manufacture of cyanide and pyrites, and metallurgical work. The metals manufactured in Australia include electrolytic zinc; soft pig-iron; refined assay, super-refined antimonial, corroding, and chemical lead; bar, sheet, and granulated silver; antifriction metal; type metal; assay and industrial litharge; copper concentrates; zinc concentrates; zinc dust; spelter; etc. The zinc industry is one of the most recent to be established in Australia, but there are already on the market locally-produced metallic zinc, in sheets of all gauges, and in other forms for a variety of purposes, zinc oxides and lithopone, zinc-lead pigment, zinc chloride, which is extensively used for the preservation of timber and in certain textile industries, and zinc sulphate.

Bacon-curing.—In 1924 the production of bacon and hams was over 62 million lb. valued at £3,697,000, and of lard over 2¾ million lb. valued at £107,000. The number of pigs killed in these establishments was 673,000. See PIGS.

Butter, Cheese, and Condensed Milk Factories.—The average annual production of butter in 1920-23 was over 234,000,000 lb., and the exports for the same period averaged 91,389,000 lb. Cheese manufactured in 1924 amounted to 24,000,000 lb. valued at £1,027,000. Before

1911 small quantities of condensed and concentrated milk and powdered milk were made, but in 1911 the output was nearly doubled; since then the industry has developed rapidly, and in 1924 the output was over 64,000,000 lb., valued at £1,964,000, and condensed milk, etc., to the approximate value of £1,000,000 was exported. The milk used at butter factories in the same year amounted to over 445,000,000 gallons; for the manufacture of cheese nearly 24,500,000 gallons were used, and for condensed milk nearly 17,000,000 gallons.

Ice and Refrigerating Works.—Large freezing-works have been installed in many parts of the Commonwealth for freezing products, chiefly for export. In 1924 over 4,000,000 lb. of frozen mutton and lamb, 105,000,000 lb. of beef, and 3,500,000 pairs of rabbits were exported.

Sugar-mills.—The cane-crushing branch of the sugar-making industry is carried on in Queensland and New South Wales, the only States in which sugar-cane is grown. From the mills raw sugar is sent to refineries in different parts of Australia for further treatment. Part of the molasses produced is used for the distillation of alcohol, part is turned into food-cake for cattle, and part is used for other purposes, but a very large quantity is run to waste. In 1924 the production of raw sugar was 286,000 tons, and of molasses 11,800,000 gallons.

The establishment of the sugar-refining industry considerably antedates that of the sugar-milling industry. The raw material was originally brought from the Mauritius and the East. In 1924 there were two refineries in Victoria, two in Queensland, one in New South Wales, and one in South Australia. At the six refineries approximately 296,000 tons of refined sugar, valued at £10,870,000, were made. See SUGAR.

Confectionery.—This industry has expanded considerably during recent years, largely as a result of the stimulus afforded by the embargo placed on the importation of luxuries during the war. Several oversea firms which previously exported largely to Australia have established factories in the Commonwealth. Since 1911 the number of confectionery factories and persons employed therein has increased nearly three-fold.

Breweries.—The main feature in the history of the brewing industry, which was established at an early date in Australia, has been a change from the small local brewery in every township of moderate size to the large, centralized, city brewery. Of the total acreage put down in barley in 1923-4 more than 84 per cent was sown with the malting variety. Hop-growing is profitable, particularly in Tasmania. The total quantity of ale and stout brewed in Australia amounts to approximately 66,000,000 gallons annually.

Tobacco, Cigars, and Cigarettes.—This was one of the first industries to be established in Australia (see TOBACCO), and the market has for many years been largely supplied by local manufacturers. Despite inducements held out to growers both by the government and by tobacco-manufacturing companies, the quantity of leaf produced locally is relatively small. In 1924 the quantity of Australian leaf used was only about 1½ million lb., as against nearly 16 million lb. of imported leaf. In 1924 the quantity of tobacco manufactured in the Commonwealth was over 14,000,000 lb.; about 431,000 lb. of cigars and over 4¾ million lb. of cigarettes were also manufactured.

Woollen and Tweed Materials.—Though Australia is one of the largest wool-growing countries in the world, only within recent years has the manufacture of woollen and textile goods been undertaken on any considerable scale. The industry was first started in a substantial way at Geelong, and this centre soon became famous for its tweeds; it is still the largest woollen-manufacturing centre in Australia, having five mills. During the war the Australian mills were for a time unable to supply the requirements of the Australian Imperial Force, although civilian trade was completely cut out; mills were therefore enlarged wherever practicable. During 1924 47 mills turned out nearly 5,000,000 yards of tweed and cloth and 7,600,000 yards of flannel, in addition to approximately 1,200,000 blankets and rugs. See WOOL.

Boots and Shoes.—This industry has for some years employed over 21,000 persons, nearly 60 per cent of them in Victorian factories. The output has also been steady, rising only from 12 million pairs in 1919-20 to 12½ million in 1923-24, although the number of factories rose in the same period from 532 to 1030; but most of the additional factories are concerned with repairs only.

Coach and Waggon Building.—In 1917 the importation of motor-car bodies was considerably restricted, primarily as a war-measure to conserve shipping space; a remarkable development of the local motor-car body-building industry ensued, and several firms have by standardizing their output reduced its cost and improved its quality.

Furniture and Cabinet-making.—Well-equipped factories exist in all the States, and the total output is valued at nearly 2¾ million pounds. Very little furniture is now imported, and Australian timber is in great demand, particularly for cabinet-making.

Gas and Coke Works.—In 1924 these works used 2,095,000 tons of coal, producing 17,500,000 feet of gas and nearly 1,750,000 tons of coke. Since 1914 many of them have begun to specialize in the recovery of by-products.

The value of production of manufacturing industries from 1906 to 1924-5 is shown in pounds sterling in the following table:—

1906 ..	31,172,000	1920–1 ..	101,778,000
1910 ..	48,100,897	1921–2 ..	112,517,000
1914 ..	59,004,000	1922–3 ..	123,188,000
		1924–5 ..	140,552,000

The following table further shows development of manufacturing industries:—

Year.	Hands employed	Salaries and wages paid (*a*).	Value of land and buildings used.	Value of plant and machinery.	Value of raw material, fuel and light used.
		£	£	£	£
1906	228,560	13,207,159 (*b*)	20,939,675	23,285,208	(*c*)
1910	286,831	23,874,959	29,506,054	28,976,735	75,394,572
1914	332,579	34,090,428	39,097,781	41,411,922	103,085,466
1920–1	386,639	62,931,718	60,831,468	68,655,270	213,555,770
1922–3	412,410	71,133,152	74,381,308	86,081,910	194,742,278
1923–4	429,990	77,278,000	82,562,000	99,553,000	207,336,000

(*a*) Excluding all amounts drawn by working proprietors. (*b*) Not including Queensland and South Australia. (*c*) Details too incomplete for publication.

The report of the Commonwealth tariff board for 1924-5 states that many conditions under which Australian manufacturers work are peculiar to this country, and place them at a disadvantage in competition with imported goods. Among these conditions are higher wages, shorter hours, payment for holidays, high cost of materials, limited market, and restricted production. In spite of these difficulties substantial expansion has taken place, and many new

industries have been recently established. Among the expanding industries are those dealing with paints and varnishes, hosiery, and knitted goods, glue and gelatine, rubber manufactures, confectionery, motor-car bodies, and shirts and collars. Among those recently established or in process of establishment are industries dealing with wire rope, telephone cables, oil-refining, railway-signalling apparatus, sewing threads and cotton, paper-pulp, gramophone records, cotton yarns, towelling, sheep-dip, water-tube boilers, storage-batteries, sheet-glass, thermionic valves, motor-generators, electric switch-gear, transformers and corsets. G.L.

Manures. Under this term are included all substances that increase crop-production by acting as plant-food. Natural manures are dung and farmyard manure, guano, blood, bones, hair, wool, seaweed and similar substances. The principal artificial manures are dried blood and bone-dust, meat-offal, superphosphate, sulphate of ammonia, potash salts, nitrate of soda, basic slag, lime and other substances which have undergone special treatment. The distinction is not always a very sharp one; substances like blood and bones are rarely used in their natural state, blood being as a rule artificially dried, and bones pulverized into bone-dust or bone-meal. On the other hand substances like kainit, gypsum, carbonate of lime, phosphate-rock and nitrate of soda, although they are minerals and used just as they come from the mine (except that they are more or less pulverized), come under the designation of artificial manures. The definitions given above are not identical with those employed in Australian legislation. When plant-feeding came to be studied scientifically, it was found that the beneficial effect of manures on plant-growth is due to the presence of three or four chemical elements—nitrogen, phosphorus, potassium and calcium; other ingredients of manure (e.g. water, carbonaceous organic matter, silica and saline matter), though beneficial to the soil from a mechanical point of view, either contribute little to the direct nourishment of the plant or are already present in the soil in sufficient quantities to render their addition unnecessary. We thus arrive at the following recognized classification of manures, based on the particular fertilizing ingredient which they provide:—(1) *nitrogenous* manures, which contain nitrogen either as organic nitrogen (such as blood, bone and offal manures), or in the form of ammonium salts (such as sulphate of ammonia), or in the form of nitrates (such as nitrate of soda); (2) *phosphatic* manures, which contain phosphorus in combination as a phosphate, generally phosphate of lime (such as rock-phosphate and superphosphate); (3) *potash* manures, which contain potassium as a potash salt (such as kainit, sulphate of potash, potassium chloride); (4) *calcareous* manures, which contain calcium in the form of lime or one of its salts (stone-lime, carbonate of lime, gypsum or sulphate of lime). Each of these ingredients has its definite function in plant-metabolism, but the functions are still somewhat obscure. It is generally recognized that nitrogenous manures promote the growth of leaf and straw, and produce a healthy green colour in the foliage. Phosphatic manures appear to encourage root-production; under Australian conditions they are most widely employed to promote vigorous growth of all crops, and, in the form of superphosphate are considered essential to the production of wheat and other cereals. Potash manures favour the formation of carbo-hydrates (such as sugar and starch), and are of special benefit, if not essential, to the successful growth of fruit and root-crops. Manures containing lime are more often used as soil-ameliorants than as direct plant-food. The special functions of lime are sweetening sour soils and lightening stiff clays. Many crops, however, are lime-lovers, e.g. lucerne and other leguminous crops, and grape-vines.

Although certain crops benefit by the application of a single fertilizing substance, a mixed manure containing all the above-mentioned plant-foods gives the best result, especially over a series of years; the most notable exception to this rule is wheat, which actually yields better when superphosphate alone is applied than with a 'complete' manure. Mixed manures are supplied locally to suit different crops and different classes of soil. Farmyard manure is a 'complete' manure, as it contains the four essential plant-foods, though in small quantities. Manures containing organic nitrogen are produced principally at abattoirs and meat-works, the blood and offal being either worked up or sold to manufacturers. Farmyard manure, bones, guano, fish-scrap, etc., also contain nitrogen in the organic form. These organic manures contain a certain amount of animal or vegetable matter which by its decomposition adds to the humus content, and incidentally increases the water-holding capacity of the soil; they are also less soluble in water than the inorganic manures mentioned later, and are consequently slower in their action. The beneficial action, however, is more permanent; the effects of a dressing of farmyard manure, for example, will persist for a considerable time. Some organic manures are more active than others, according to the rate at which they undergo fermentation in the soil. Fresh urine or blood is almost as readily available as an inorganic manure, whereas substances like horn-meal, hair and wool, or leather refuse, resist decomposition for a very long time. The order of solubility is roughly as follows:—fresh urine, dried blood, dried and ground flesh and offal, guano, fine bone-meal, oil-cake, fish-scrap, dung, coarse bone-meal, horn-meal, hair and wool, leather scrap. Those at the end of the list are often treated with sulphuric acid, just as bones are treated in the manufacture of superphosphate; this increases their solubility and converts them into comparatively quick-acting manures. Organic manures also differ considerably in their nitrogen content. Substances like dried blood, dried flesh, fish-scrap, etc., contain on the average 11 to 13 per cent nitrogen, or even more; farmyard manure does not contain more than ½ per cent.

Inorganic nitrogenous manures consist of saline matters derived from mineral substances, and contain no humus-forming material. The contained salts are very soluble in water, and are thus immediately available to plants; being readily washed down into the subsoil, they are most beneficial when applied in small quantities to the growing plant. Among inorganic manures of Australian manufacture the principal is sulphate of ammonia, derived from the ammoniacal liquor produced at gas-works; it is a white crystalline powder when pure, and contains about 20 per cent of nitrogen in combination. Very soluble in water, it is immediately available as plant-food, and is on this account much used as a top-dressing for crops and pastures. It must not be mixed with lime, nor applied to soil which has been recently limed, as the lime drives off the ammonia, which is dissipated in the air (the

same caution applies to fertilizers containing organic nitrogen). Dissolved in water at the rate of from ½ to 1 oz. per gallon, it is very beneficial to flowers and pot-plants, especially on clay soils. Nitrate of soda (Chile saltpetre) is imported from the nitre-deposits of Chile and Peru. Whereas importations to the continent of Europe and Great Britain attain enormous figures annually, only relatively small quantities reach Australia, as the high freights make it more expensive than sulphate of ammonia, and it does not appear to have higher manurial value. It contains about 16 per cent of nitrogen. Calcium cyanamide (nitrolim) is obtained in the fixation of nitrogen from the atmosphere by passing air over calcium carbide at the high temperature produced by an electric furnace. It has a lower nitrogen-content than sulphate of ammonia. Though used extensively in Europe and America, it is not yet produced for the market in Australia, and the high cost of oversea carriage makes it practically unprocurable otherwise. Calcium nitrate (nitrate of lime), which contains about 13 per cent of nitrogen, is the substance obtained when air is subjected to the discharge of the electric arc; at this high temperature the oxygen and nitrogen of the air unite to form oxides of nitrogen, which when absorbed by lime are put on the market as nitrate of lime. Like nitrolim, it is not produced in Australia and is costly to obtain from outside.

Phosphatic manures are more generally used in Australia; in most wheat-growing areas manuring is practically confined to the application of superphosphate. Phosphoric acid is applied to the soil in the form of phosphate of lime, and occurs naturally in rock-phosphate, bones and guano. Bone-dust is a phosphatic as well as a nitrogenous fertilizer, and only requires the addition of a potash salt to make it a complete manure. Rock-phosphates, which contain no nitrogen, constitute the principal source of superphosphate. They are brought to Australia in large quantities from the Pacific islands; considerable deposits have been found on the mainland and placed on the market, in the ground state or made into superphosphate. The phosphate of lime in rock-phosphate, bones and guano, is tri-calcic phosphate, insoluble in water; these substances are consequently very slow in their action—particularly mineral phosphate (phosphate rock)—and must be reduced to a fine powder before they are likely to act as plant-food. When converted by treatment with acid into superphosphate, they form a mono-calcic phosphate readily soluble in water and rapidly assimilated by the growing plant. True guano is the dung of fish-eating birds, deposited in enormous quantities on areas of Chile and Peru and on certain islands. Fresh guano contains both nitrogen and phosphoric acid; but in course of time the nitrogenous matter is dissipated by fermentation and leaching, and the older deposits are almost pure phosphate of lime, consolidated to a rock through pressure. The term is, however, commonly applied to other substances, e.g. bat-guano, the dung of bats and flying foxes, frequently found in extensive deposits in caves where these animals breed; and fish-guano, which is merely fish-scrap or refuse. Manufacturers also use it to denote an artificial mixture of one or more manurial substances; thus mixtures of sulphate of ammonia, superphosphate and sulphate of potash are often called guanos.

Superphosphate is by far the most widely used fertilizer in Australia. It is manufactured from rock-phosphate or bones ground finely and mixed with sulphuric acid; to the ground-up bones or rock enough acid is added to moisten it and the mixture, when thoroughly stirred, is stacked in heaps to dry. The acid converts the original tri-calcic phosphate (which is insoluble in water) into a mono-calcic water-soluble phosphate. Sulphate of lime is also formed by the reaction, so that, though essentially a phosphate manure, the mixture contains a considerable quantity of lime salts. The superphosphate usually sold contains about 17 or 18 per cent of water-soluble phosphoric acid, equivalent to 36 to 38 per cent of phosphate of lime. The great fertilizing value of superphosphate is due to the fact that, being in solution, the phosphate is very much more finely divided and distributed in the soil. As soon as superphosphate is in contact with the soil, it is believed to combine with the carbonate of lime and such iron and alumina as may be present, passing from the water-soluble condition into another form of phosphate of lime; this is insoluble in water, but soluble in the weak acids in the soil, and is known as 'citrate-soluble' or 'reverted' phosphoric acid.

Nitrate of soda, which is generally used by growers in Europe and America, is practically unused in the wheat-lands of Australia, its place being taken by superphosphates. The addition of nitrogenous and potash manures appears to have little or no effect on the wheat-yield either when used alone or in mixtures; on the other hand, the application of superphosphates (even in such small quantities as 30 to 40 lb. to the acre) produces a very marked influence on the yield. In comparatively moist and cool climates the wheat commences to grow at a time of year when nitrification is inactive, and when any nitrates that were present in the soil have been washed out, whereas the active nitrification-period is during the summer months, when the plant has already arrived at a certain stage of maturity. Nitrate of soda is therefore useful as supplying the nitrate necessary for early growth. In Australia nitrification is active and progressive during the early stages of the plant's growth, and no additional nitrogenous manure is required; but the soils are for the most part deficient in phosphoric acid, which promotes the development of the root-system and thus ensures for the young plant a vigorous start.

Basic slag or Thomas phosphate, another form of phosphoric acid, is occasionally procurable in the Australian market. It is used extensively in Europe and America, where it can be obtained at a low cost as a waste product in the manufacture of steel in the Thomas-Gilchrist process. It contains, in the form of phosphate of lime, the phosphorus that was originally in the pig-iron. This phosphate of lime, unlike any of those hitherto discussed, is a tetra-calcic phosphate, insoluble in water, but citrate-soluble like the bi-calcic or reverted phosphates already mentioned. It cannot be either imported or produced locally in competition with superphosphate; but it has the advantage of containing free lime, so that it is an alkaline fertilizer (whereas superphosphate is acid), and is consequently better adapted for sour soils and stiff clays.

The potash-salts used as fertilizers in Australia are sulphate of potash, potassium chloride (muriate of potash), and kainit—all in pre-war days imported from the potash-mines at Stassfurt, Germany, which practically held the monopoly of the world's supply of potash. Sulphate of potash was most in demand locally, as it is a concentrated form, containing about 52 per cent of potash, and is more generally applicable.

It is used by manure-manufacturers principally to supply the necessary potash for their 'complete' manures. Potassium chloride has a somewhat higher potash-content than the sulphate, but is less widely applicable; a few crops—potatoes and tobacco among the number—do not do so well when manured with chloride. During the war the source of supply was cut off and potash-salts were unobtainable, substitutes being found in substances rich in potash, such as wood-ashes, ground felspar, etc. Immediately after the war potash-mines in the neighbourhood of Mulhouse in Alsace were opened up by a French company to supply potassium chloride, which was for some time the only potash-salt available. At the present time both sulphate and chloride are on the market again. Kainit is a mixture consisting principally of chlorides and sulphates of potash and magnesia. It contains about 12 per cent of potash.

Attempts are being made to utilize local sources of potash supply, but no potash-mines have as yet been discovered in Australia, and other sources must be sought. Among the substances most likely to supply the demand are wood-ashes, potash-felspar, alunite, kelp or seaweed ash, wool-suint, wine-press residues, argol and tartar. Wood-ashes contain all the mineral elements of a complete fertilizer, and may be used for pastures, leguminous crops, fruit-trees and other crops. They consist chiefly of carbonates of lime and potash, together with phosphates of the same bases; the potash compounds are water-soluble and readily available. Nitrogen is absent, having been driven off in the burning process. The potash-content varies according to the nature and age of the original tree, and the part of it from which the ashes were obtained. The ash of young wood is particularly rich in potash; generally speaking, indeed, the ash of young and small wood is more valuable than that obtained from the trunks of old trees.

The manures which depend for their action on the presence of lime are carbonate of lime, burnt lime and sulphate of lime (gypsum). Carbonate of lime occurs in nature in rock-masses as limestone, chalk or coral, and is used, after pulverization, to sweeten sour soils or to enrich soils poor in lime. Burnt lime as a soil-ameliorant is superior to carbonate of lime, since it possesses the property of breaking up stiff clay soils and rendering them friable. It is usually applied at the rate of about ½ ton to ¾ ton per acre. The stone-lime, broken up into lumps, is placed in heaps on the field, where it slakes when exposed to moist air, and crumbles to a soft white powder that can be spread evenly over the surface and harrowed in very lightly. Under dry conditions it may be necessary to water the heaps to assist the slaking process.

Gypsum (sulphate of lime, land-plaster, copai), occurs, like carbonate of lime, in rock-masses. It is applied only to soils poor in lime, or to crops like legumes and grape-vines. It is not a soil-ameliorant, but has been successfully employed on land suffering from alkaline bore-water; for this purpose it may either be sown on the land in the powdered form, or placed in the irrigation channels, or—if the water is stored—in the tanks or reservoirs. So-called 'agricultural' lime, really screenings from the lime-kilns, consists of the smaller pieces and imperfectly burnt or over-burnt lime unsuitable for building. Other waste-products rich in lime are (*a*) lime from fellmongeries, where it is used to remove hair from the hides; it contains a considerable quantity of hair and organic matter, and is thus also a nitrogenous manure; (*b*) lime-residues from acetylene-generators, which are almost pure slaked lime and carbonate of lime, and can be used instead of carbonate of lime; (*c*) gas-lime, procurable from gas-works where lime is used during the purification of coal-gas; the spent product affords the farmer a cheap source of lime. F.B.G.

Maori. See WRASSES.

Marbles. See BUILDING AND ORNAMENTAL STONES.

March Flies. See BLOOD-SUCKING FLIES.

Margarot, MAURICE. See MUIR, THOMAS.

Marine Fibre, the name applied to the fibrous portion of the leaf-sheath of *Posidonia australis*, a plant growing in shallow waters along the southern coast of Australia, especially in Spencer and St. Vincent gulfs. It appears to be endemic in Australia; a near relative, *Posidonia oceanica*, is limited to the Mediterranean and the European shores of the Atlantic Ocean. It is not a seaweed, but a submerged flowering plant of the family Zostereae.

Normally the plant grows in masses on the sea-bottom, dies, and disappears. But in comparatively sheltered localities—especially those in the north-eastern corners of the two South Australian gulfs, on which the prevailing south-east winds accumulate a good deal of drift-sand and similar matter—the fibrous residues of the rotted leaves and stems have accumulated in the drift (which seems to preserve them) and fresh colonies of *Posidonia* have grown on the bottom thus formed, until in some parts of Spencer Gulf the deposits are seven feet thick. Every cubic yard of deposit yields fibre that, when air-dried, weighs about 6 lb., its constituent filaments being sometimes 9 in. long and about as coarse as those of jute. Their mean breaking strain is 20.15 kilograms per sq. millimetre of cross section, slightly less than that of jute. They are brittle under a sudden strain, though elastic if the strain is steady and direct.

The fibre was first brought into prominence in 1902, when S. H. Manners applied for permission to work the deposits near Tickera, a little north of Wallaroo on Spencer Gulf. For some time, indeed, it was known to commerce as Tickera fibre. In 1905 Manners took to England samples of the cleaned fibre, and Marine Fibre and Yarns, Ltd., was formed to exploit the deposits; later on, another company was floated in Sydney, and a third in Holland, and many areas were worked by private speculators. In June 1911 375 sq. miles of deposits were held under lease from the South Australian government; but great difficulty was experienced in separating the fibre from the sand in which it was embedded, and the parent company ceased operations at the end of 1911 after having produced only 25 tons of marketable fibre. It was then that the Sydney company—Australian Marine Fibres, Ltd.—solved the problem of separation, only to be confronted with the no less difficult one of drying the product. However, it and its successor Posidonia, Ltd., in six years managed to obtain about 220 tons from deposits near Port Broughton. The Dutch company, which began operations in 1913, using a more costly process which involved the use of fresh water for cleaning the fibre, obtained from deposits in the Port Piric region about 120 tons in four years.

Posidonia fibre has been scientifically investigated by the Imperial Institute in 1909 and 1911,

by the South Australian department of chemistry in 1917, and by the Commonwealth Institute of Science and Industry in 1919. Its possible commercial uses, suggested by these authorities, are (*a*) as a diluent of wool in the manufacture of low-grade fabrics; (*b*) for manufacture into guano-bags, horse-blankets, etc., which have to stand no great strain but are much exposed to the weather or to chemical action; (*c*) as an insulating agent for heat; (*d*) as a substitute for jute in the backings of oilcloth and rugs, and for horsehair or kapok in bedding and upholstery; and (*e*) for papermaking. Up to the present time its principal use has been as an insulating agent.

See *Bulletin No. 14* of the Institute of Science and Industry (Melbourne, 1919), and *Bulletin No. 4* of the South Australian department of chemistry (Adelaide, 1916).

Marsden, SAMUEL (1764-1838), born at Farsley near Leeds in Yorkshire on 28 July 1764 and educated at the free grammar school of Hull, was apprenticed to blacksmithing at Horsforth, but by his piety and ability attracted the attention of the Elland Society (of which William Wilberforce was a prominent member), and in 1790 was sent by them to Magdalene College, Cambridge, to be trained for the ministry. Wilberforce and his associates had been partly responsible for sending the first chaplain, Richard Johnson (q.v.) to New South Wales, and when he asked for assistance they recommended Marsden, who was appointed assistant chaplain for the colony on 1 January 1793. He was ordained priest, sailed in the storeship *William* on 28 August 1793, and reached Sydney on 10 March 1794. On arrival he settled in Parramatta, holding services until 1796 in a carpenter's shop fitted up for the purpose; he then erected a 'wooden temple' on the south-eastern corner of George- and Marsden-street, and in 1797 the foundation-stone of St. John's church was laid (see CHURCH OF ENGLAND). On 15 December 1794 Marsden took over the duties of the military chaplain, James Bain, and in 1800, when Johnson went on leave, was left in charge of religious functions at Sydney, Parramatta and the neighbouring districts. He also took a lively interest in the Pacific missions of the London Missionary Society. He was a magistrate and superintendent of public works at Parramatta and Toongabbie, and took an active part in the establishment and control of orphan schools. But these multifarious official duties did not absorb all his phenomenal energy; he was commended by Governor King as 'the best practical farmer in the colony,' and was a keen student of sheep-breeding and wool-production (see SHEEP). In 1802 Péron, one of Bougainville's officers, spoke in glowing terms of his model farm, Mamre, near St. Mary's, and by 1806 he had acquired by grant or purchase 2908 acres carrying 1416 sheep. In 1807 he visited England, and while there induced William Cowper and Robert Cartwright to offer themselves as assistant chaplains; he also arranged with the Church Missionary Society to organize missionary enterprise in New Zealand. He was in England when news arrived of the deposition of Bligh, and at once championed the cause of the ex-governor, thus drawing down upon himself John Macarthur's wrath.

Marsden returned to the colony early in 1810 and, though senior chaplain, was permitted to remain at Parramatta, an assistant being stationed at Sydney. From the outset he opposed Macquarie's emancipist policy, and this remained a permanent cause of misunderstanding between them; for more than seven years, however, their relations remained outwardly cordial. Macquarie, to check the growth of sectarianism, ordered Marsden to desist from certain 'methodistical' practices introduced by him into the church services, but gave him constant support in his missionary enterprises. When in 1814 Marsden proceeded to New Zealand to establish a mission in connection with the Church Missionary Society, Macquarie gave the undertaking a semi-official status. Marsden, however, bought a vessel at his own expense to further the enterprise, and used it to promote trade in island products. He does not seem to have profited materially from his trading connections; but he had strong secular leanings, and was (as Bigge suggested) 'less sensible than he ought to have been to the impropriety of combining operations of a mercantile nature with the duties of his profession.' Moreover, though zealous for the New Zealand mission, he showed no interest in Macquarie's efforts to improve the conditions of the Australian aborigines. On 4 January 1817, J. T. Campbell, the governor's secretary, published anonymously in the *Sydney Gazette* (of which he was censor) a bitter attack on Marsden's missionary activities. On the advice of the judge-advocate (who hoped thereby to facilitate a private settlement of the quarrel) Macquarie publicly dissociated the government from the views expressed in the letter, for which he was in no way responsible; but Marsden insisted on prosecuting Campbell, and on 1 December 1817 was awarded heavy damages for libel. On the same day Macquarie tendered his resignation to Lord Bathurst. Early in the year he had received from the colonial office a letter from a colonist containing serious charges against his administration, and alleging ill-treatment of prisoners; this letter he believed to have been written by Marsden—it was in fact the work of Nicholas Bayley, one of Marsden's friends—and he attributed the unfriendly tone of recent official communications to Marsden's secret machinations. In denying the charges, he pointed out that the punishments inflicted by Marsden's authority were much more severe than those of any other magistrate in the colony. (After a long controversy Marsden published in 1826 *An Answer to certain Calumnies in the late Governor Macquarie's Pamphlet and the Third Edition of Mr. Wentworth's Account of Australasia.*) Long opposed by Marsden on the emancipist issue, and embittered by recent developments, Macquarie now refused to recognize the chaplain as a private acquaintance, and in 1818 dismissed him from the magistracy in a very humiliating manner. Marsden thereupon applied for leave to visit England on the ground that he wished to secure the services of additional chaplains, and was refused because Macquarie believed his real motive to be an attack on the administration. In 1819 Marsden again visited the New Zealand mission, and thereafter Bigge's influence had a moderating effect on both governor and chaplain.

Brisbane had no high opinion of Marsden, and soon complained of his 'daily neglect of the spiritual concerns of his Parish for the sake of attending to his own multitudinous temporal affairs.' In 1822 he removed from the commission of peace the names of Marsden (who had been reappointed on Brisbane's arrival) and four other magistrates for refusing to sit with

Dr. Douglass, superintendent of the female factory and a close friend of the governor. In the following year Marsden was fined by the Parramatta bench (on which Douglass was sitting) for a minor offence, the fine being ultimately secured by distress warrant; Marsden thereupon sued the magistrates in the supreme court, which decided that they had acted without authority (though not maliciously) and awarded him the amount of the fine and costs. Marsden appealed to the British home secretary; he passed the complaint on to the colonial office, which ordered Governor Brisbane, Chief Justice Forbes, and Archdeacon Scott to inquire into several allegations against Douglass. Their report, issued in August 1825, cleared Douglass and showed that Marsden's statement to the home office was inaccurate; to straighten out a few irregularities in procedure, to which Marsden himself had been a party in past years, a bill of indemnity was passed to protect magistrates from further proceedings. Earl Bathurst thereupon instructed Brisbane to censure Marsden in private (a public reprimand would, he considered, prejudicially affect the position of the clergy) and 'intimate to him my expectation that he will for the future repress the vehemence of temper, which has too frequently marked his conduct of late, and which is as little suited to his Age, as it is to the profession to which he belongs.' Marsden in 1828 published a *Statement, including a Correspondence between the Commissioners of the Court of Inquiry and the Revd. Samuel Marsden,* in which he imputed motives of partiality and injustice to the committee; this called forth a refutation, in a letter to the colonial office, by Chief Justice Forbes; and with that the unseemly controversy was brought to a close.

Marsden thenceforth devoted his failing energies to his ministerial work, now under the supervision of Archdeacon Scott. The New Zealand mission, the most noteworthy enterprise of his life, developed rapidly under his guidance; altogether he paid it seven visits, the last in 1837. His relations with Brisbane's successors were friendly, and several recommendations were made by them to the colonial office in favour of a suitable provision for his old age. He died at Windsor on 12 May 1838, leaving behind him a reputation for somewhat unbalanced and often misdirected zeal in his New South Wales career, but for excellent good sense and apostolic enthusiasm displayed in all his work for New Zealand.

Marsupials, an order of mammals of limited geographical distribution, most richly developed in the Australian region. The name is derived from the marsupium or pouch present in the females of most marsupials, which serves for the transport and protection of the young; such a pouch is not developed in any other mammals except, in a modified form, in the monotreme *Tachyglossus* (echidna, q.v.). Among other distinguishing features, one of the most striking is the nature of the relations between the female parent and her offspring. Like the higher mammals, the marsupials are viviparous; but in the higher mammals special provision is made for the nourishment of the young animal before birth, a close relationship being established by means of the placenta between the blood-systems of the mother and of the young or foetus. Most marsupials have no placenta: only one of them —the bandicoot—has a placenta of the same nature as that of the higher mammals, and in its case the structure is much simplified. In consequence of this imperfect provision for the nutrition of the foetus, the young of the marsupial is born comparatively incomplete, and remains a 'mammary foetus,' helplessly hanging to one of the teats within the pouch for a considerable time before it is able to make any effort even to draw the milk.

The milk-glands, or mammary glands, of the marsupials are essentially of the same nature as those of higher mammals; the chief peculiarity

'Mammary foetus' of kangaroo lying inside pouch.

about them is that a muscle which extends over them is under the control of the animal; when it is contracted the milk is squeezed into the mouth of the helpless 'mammary foetus.' By a special arrangement of the infant's air-passages it is possible to draw in air through the nostrils and down the windpipe to the lungs without interfering with the passage of milk to the gullet. The smallness and helplessness of the newly-born marsupial, together with the fact that bleeding follows forcible removal from the teat, have led to the wide acceptance among bushmen of the remarkable doctrine that the young animal grows on the teat much as an apple grows on a tree. The birth of the marsupial is seldom actually observed; but the conveying of the young by the mother's lips to the pouch, and the adjustment of the mouth over the end of the teat, have been described by various observers of repute. On the other hand, others have described from personal observation the struggles of the newly-born young of the kangaroo over the mother's fur by movements of the fore-limbs—which at this stage are better developed than the hind-limbs—until they reached the pouch and attached themselves to the teat. However this transference may take place (and there is doubtless variation of method in different cases), it does not affect the question of the actual mode of birth, which does not fundamentally differ from that in other mammals. The bleeding which takes place when the 'mammary foetus' is forcibly removed is due to the fact that the extremity of the teat becomes enlarged after it has been received into the mouth of the young animal, and the

force necessary to pull the foetus off ruptures the skin of the teat.

Australia is the headquarters of the marsupial order, and the greater part of her mammalian fauna belongs to that group. Owing to the geographical isolation of the continent through long ages—during which the higher mammals were being evolved and reaching predominance in other parts of the world—the primitive monotreme and marsupial fauna remained undisturbed, and the marsupials underwent a variety of modifications adapting them to a great variety of modes of life; consequently families of Australian marsupials show a remarkable correspondence in structure and mode of life with families of higher mammals in other regions. Thus kangaroos and wallabies, grass-eating mammals with the limbs adapted to swift movement on the ground, are the marsupial equivalents of deer, antelopes, buffaloes, and other ruminants; the tree-inhabiting 'opossums' (phalangers) and native bears (koalas) are comparable to the tree-inhabiting lemurs and monkeys, as are 'flying opossums' to flying squirrels. The bandicoots on the one hand and the wombats on the other represent other families of rodents. The carnivorous native cats, Tasmanian devil, and Tasmanian wolf closely parallel some groups of the true Carnivora; moles of the order Insectivora find a marsupial analogue in the marsupial mole (see MOLE, MARSUPIAL) of the Australian desert.

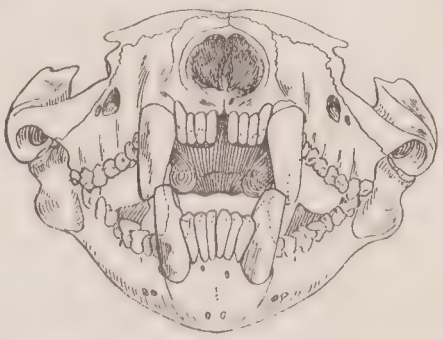
Marsupials are conveniently divisible into two main sections or sub-orders—Diprotodontia, with two front teeth, and Polyprotodontia, with many front teeth. In Diprotodontia it is only in the lower jaw that the number of well-developed front (incisor) teeth is actually reduced to two: there are nearly always more than two in the upper jaw, but of these the two central teeth

Diprotodont:—front view of skull of Koala (*Phascolarctus cinereus*).

are specially developed, and correspond to the two prominent front teeth of the lower jaw against which they work. In Polyprotodontia there are usually four incisor teeth on either side in the upper jaw, and three in the lower.

Besides the difference in the teeth, diprotodonts differ from polyprotodonts in the universal occurrence in the former—and absence in the latter (excepting the bandicoots)—of syndactylism, that is to say, the union of the second and third toes (usually small and slender) by a web of skin.

Diprotodonts comprise kangaroos and wallabies, wombats, Australian opossums (phalangers), and the koala (native bear). Polyprotodonts include among others native cats, bandicoots, the marsupial mole, and the true American opossums (Didelphyidae). The last-named family includes all marsupials now found living outside the Australian region, with the exception of one small rat-like form, *Caenolestes*, which



Polyprotodont:—front view of skull of Tasmanian Devil (*Sarcophilus harrisi*).

occurs in Bolivia and Ecuador. *Caenolestes* cannot be definitely assigned either to the diprotodont or to the polyprotodont sections; its nearest relatives appear to be certain extinct families, the remains of which occur in beds regarded as of Tertiary (Miocene) age in South America. Virtually all the diprotodonts now living are inhabitants of the Australian region.

The difference in teeth between Diprotodontia and Polyprotodontia is connected with radical differences in habits and mode of life, more particularly in the nature of the food. In the diprotodonts the food consists of herbage, leaves of trees, fruit, and roots; and the grinding-teeth are adapted to this class of food. The polyprotodonts, on the other hand, are carnivorous or insectivorous, the modifications which their teeth undergo resembling remarkably those that characterize the true Carnivora (e.g. cats and dogs) or the true Insectivora (e.g. moles and hedgehogs). All marsupial teeth, however, are uniform at least in one respect, in which fossil forms, so far as is known, agree with living. Most mammals have two sets of teeth, of which the first-formed set (the 'milk' or deciduous series) sooner or later is lost and replaced by the teeth of the second or permanent set. Of the teeth of the permanent set a small number—one to four on each side of each jaw—do not actually replace members of the 'milk' series, behind the last of which they are developed. They are the molar teeth of the permanent series, and the teeth immediately in front of them, between them and the usually prominent eye-teeth or canines, are called pre-molars. In marsupials there is never more than one complete set of teeth, and it is doubtful whether this corresponds to a 'milk' set which persists throughout life, or to a permanent set which has no milk-teeth preceding it. One tooth alone of the whole series undergoes replacement; this is the tooth corresponding either to the third or to the fourth pre-molar.

Though marsupials are more abundant and more varied in Australia than in any other part of the world, yet, as already indicated, the order is not by any means confined to this strictly circumscribed region. An entire family (that of

the true or American opossums, comprising about 24 species) is confined to America; the only living representative (*Caenolestes*) of an entirely distinct group is also an inhabitant of the same continent. But in addition the Australian marsupial fauna has overflowed the boundaries of the continent. Tasmania, isolated from Australia proper only in comparatively recent ages, practically forms a part of the mainland in a zoological sense, though retaining certain forms (such as the Tasmanian devil and the Tasmanian wolf) that have vanished from the mainland. New Guinea, likewise recently separated, contains over 60 species of marsupials (wallabies, tree-kangaroos, cuscus phalangers, bandicoots, and native cats). A wallaby occurs in the Aru Islands; a *Phascogale* and a wallaby in the New Britain group; a cuscus in Amboina, the Solomons, Timor, and some of the smaller islands, and another cuscus in Celebes.

See BANDED ANTEATER, BANDED WALLABY, BANDICOOTS, DORCAS KANGAROO, DORMOUSE OPOSSUM, FLYING OPOSSUMS, HARE-WALLABY, KANGAROOS AND WALLABIES, KOALA, LONG-SNOUTED HONEY-MOUSE, MOLE, MARSUPIAL, MUSKRAT-KANGAROO, NAIL-TAILED WALLABY, NATIVE CATS, OPOSSUMS, POUCHED MICE, RAT-KANGAROOS, ROCK-WALLABIES, TASMANIAN DEVIL, TASMANIAN WOLF, TREE-KANGAROOS, WOMBATS, WYULDA, and for fossil marsupials PALAEONTOLOGY.

See Gould's *Mammals of Australia*; Oldfield Thomas's *Catalogue of the Marsupials in the British Museum*; Lydekker's *Hand-book to the Marsupialia and Monotremata*; *The Royal Natural History*, vol. iii, (1894-5); Ogilby's *Catalogue of Australian Mammals* (1892); Lucas and Le Souef's *The Animals of Australia* (1909); and Wood Jones's *The Mammals of South Australia* (1923-5). W.A.H.

Martens, CONRAD (1801-1878), born in the parish of Crutched Friars near the Tower in London, was the son of a Hamburg merchant who permitted his three sons to take up the perilous career of art. Conrad chose Copley Fielding, the most fashionable teacher of the day, for his master, and was well grounded in the practice of water-colour and drawing with the point. In 1832 he left England, probably sailing for South America in H.M.S. *Hyacinth*; he was certainly in Monte Video when the *Beagle* arrived there with Charles Darwin on board. Martens replaced Augustus Earle (invalided home) as official topographer, and remained with the expedition for two years. He left the *Beagle* at Valparaiso in July 1834, sailed for Tahiti in a Yankee schooner on 3 December, and for a couple of months made sketches on the island. He left for Sydney on 4 March 1835, and after staying at the Bay of Islands in New Zealand for five days in April, made his first sketch of Port Jackson Heads on the 17th of that month.

Martens lodged in Cumberland-street, overlooking Sydney Cove, and set up as a drawing-master. He had also a studio in Mort's buildings, which he retained till as late as 1856. In 1844 he built for himself a cottage at St. Leonard's on the northern side of the harbour. Most of his income was derived from painting or drawing big country-houses for their owners, and from the sale of views of Sydney harbour —including a notable hand-coloured lithograph of Sydney from the North Shore for which he found a ready market. His leanest year brought him in £50, his fattest £350; in 1863, when too old to continue painting, he was made assistant parliamentary librarian. He died of angina pectoris on 21 August 1878.

A man of good taste and some reading, Martens was the first painter of note to settle in Australia and win respect for his art. As a sketcher he is still pre-eminent, for he was extraordinarily skilful in suggesting and defining landscape form. His innumerable drawings form a topographical history of his times. He painted a little in oil, but never mastered that medium as he did water-colour. His compositions are in the classic and Turnerian tradition, yet he had an eye for the character of a landscape. He painted invariably from notes and studies, and made sincere efforts to convey Australian forms, but his method was not favourable to realism. Always a graceful painter, his fame rests upon his pencil sketches and views of Sydney harbour, of whose beauty he was the first exponent. See ART.

See *Conrad Martens: the Man and his Art* (Sydney, 1920), which contains reproductions (mostly in colour) of more than 60 of his pictures and sketches, prefaced by a biography and a critical estimate of his work. L.L.

Martin, CHARLES JAMES, born in London in 1866 and educated at King's College, London, and the university of Leipzig, was in 1887 made demonstrator in biology at King's College and in 1891 demonstrator in physiology in the university of Sydney. Here for six years he made important researches into the embryology of the *Ornithorhynchus anatinus*, collaborating with J. T. Wilson (q.v.), and the effects of snake-poison on human blood. Transferred to Melbourne in 1897 to act as locum tenens for the professor of physiology there, he was in 1901 given the professorship, but soon afterwards left Australia to conduct for the British government investigations into anti-typhoid inoculation (chairman of war office committee, 1904-7) and the plague in India (member of joint advisory committee, 1905-13). In 1906 he was made director of the Lister institute of preventive medicine, which position he still (1926) holds. During the war he served with the A.I.F. as lieutenant-colonel in the A.A.M.C. on the Gallipoli Peninsula and in Egypt, Palestine and France. He is also professor of experimental pathology in the university of London, F.R.S. (1901), fellow of King's College, and D.Sc. of London and Melbourne, and holds honorary degrees of several other universities. (C.M.G., 1919.)

Martin, SIR JAMES (1820-1886), born at Midleton in county Cork, Ireland, on 14 May 1820, was brought by his parents to New South Wales in 1821, and educated at the Sydney Academy and Sydney College under W. T. Cape (q.v.). On leaving school he joined the staff of the *Australian*, for which he reported the proceedings of the legislative council, gaining thereby detailed information of parliamentary practice. In 1838 he published a slight volume of essays, *An Australian Sketch Book*. Two years later he was articled to G. R. Nichols (a prominent lawyer who had a proprietary interest in the *Australian*), and in 1845 was admitted a solicitor. When the *Atlas*, the squatter's organ, was established in 1844, he contributed to it fiery articles denouncing Governor Gipps, and shortly afterwards became editor—a position he held for about two years. In 1848 he was elected to the legislative council for Cook and Westmoreland, but was unseated on petition, being without the requisite property qualification; in 1849 he was returned unopposed, and retained his seat until the dissolution of the council in 1856. In August 1856, under responsible government, he became attorney-general in the Cowper ministry; as he was still only a solicitor the bar took umbrage at his appoint-

ment, and his political opponents carried a vote of censure upon the government. Before Cowper returned to power in 1857 Martin was called to the bar (Q.C., 1857), and his reappointment as attorney-general was unopposed, but he resigned in the following year. In 1863 he became premier and attorney-general; in 1864 the country rejected his proposals for a protective tariff, and he was in opposition until 1866, when he again formed a ministry, having induced Henry Parkes (q.v.), who opposed his fiscal policy, to become colonial secretary. Martin supported the education reforms fathered by Parkes, and was himself responsible for the industrial schools act and for the establishment of juvenile reformatories. His ministry was responsible for the Duke of Edinburgh's reception in 1867 and for the measures taken to frustrate any conspiracy against the Crown after O'Farrell's attack on the Duke at Clontarf. In October 1868 he resigned, but from December 1870 to May 1872 was again premier and attorney-general with John Robertson (q.v.), an erstwhile opponent, as colonial secretary. In November 1873 he was appointed chief justice of New South Wales with the unanimous approval of the bench and bar. From 1858 to 1878 he was a member of the senate of the university of Sydney. He died on 4 November 1886. (K.C.B., 1869.)

Martins. See SWALLOWS AND MARTINS.

Masson, SIR DAVID ORME, only son of Professor David Masson the late historiographer royal for Scotland, was born in London on 13 January 1858, educated at the Edinburgh Academy and the university of Edinburgh (M.A., 1878; B.Sc., 1880; D.Sc., 1884; hon. LL.D., 1924), and studied at Gottingen. In 1880-1 he lectured at University College, Bristol, as assistant to Professor William Ramsay, in 1882-5 held a research fellowship at Edinburgh, and in 1886 was appointed to the chair of chemistry at the university of Melbourne. This chair he held until 1924, when he was made professor emeritus. In 1912-16 he was a member of the council of the university and president of the professorial board.

In 1903 his chemical researches brought him a fellowship of the Royal Society of London. These researches extend over a wide range of subjects, the most important being those dealing with fundamental aspects of the ionic dissociation theory (particularly transport numbers) and the kineties of complex chemical reactions —such as that between hydrogen peroxide and potassium cyanide, and the hydrolytic decompositions of metallic cyanates and persulphuric acid and its salts.

Outside his strictly professorial work he has done much to advance public interest in scientific enterprises. From 1890 onwards he fostered the Australasian Association for the Advancement of Science, of which he was president in 1911-13; he gave valuable help to Mawson's Antarctic expedition of 1911-13; during the war he was deputy-chairman of the Commonwealth advisory council of the institute of science and industry (q.v.); in 1917 he led the movement to found the Australian Chemical Institute, and since 1922 has been president of the Australian national research council, of which he was an original member. Among other public services may be reckoned his active membership of a royal commission on the sanitation of Melbourne (1890), of the Victorian board of health, and of a board appointed by the Commonwealth to report on a proposed local issue of silver coinage. (C.B.E., 1918; K.B.E., 1923.) A.C.D.R.

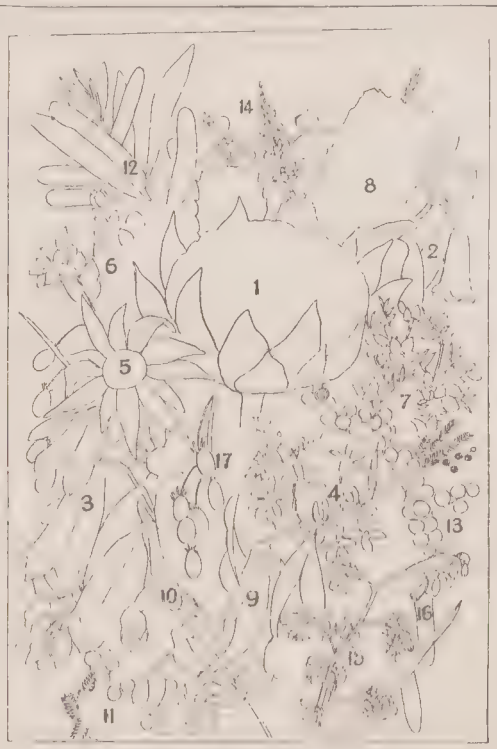
Matchbox Bean. See ENTADA.

Matra, JAMES MARIO, is first heard of as a member of the *Endeavour's* crew under Cook; he was entered in the ship's books as 'Jas. Magoa (A.B. to 27 May 1771, then mid.).' In Cook's journal he figures as 'Magra,' and for some reason this was the spelling adopted by himself up to March 1775, and by his brother Perkins as late as 1795. From 1777 onwards, however, James persistently used the form 'Matra,' signing himself in the form given at the head of this article. In modern histories the variant 'Maria' is common, and 'Jean' also occurs. The Matras were a leading family of Corsica, but some of them quarrelled with Pasquale Paoli and even fought against him on the side of the Genoese invaders of the island; in consequence, the family was driven from its home and settled in New York, where during the Revolution it remained loyal to England. James was born in New York, and educated in England. During his term of service aboard the *Endeavour* he struck up a friendship with Banks that lasted the rest of their lives. In 1772 he was made British consul at Teneriffe; in 1777 he visited New York to recover what he might of the family property; in 1778 he became secretary to the British embassy at Constantinople. Five years later he appeared in London. What had happened in the interim we do not know; but he told Banks that 'for many months past I have been obliged to lead the life of a solitary fugitive . . . secluded as I was from Society.' From other sources we know that he was just then pressing his claims as a ruined American 'loyalist' and asking for a consulate somewhere in Spain. At the moment, as it happened, people in London were discussing the possibility of making new settlements in the South Seas; Banks had devised one plan for settling New South Wales, and Sir George Young another; there were also vague ideas regarding Madagascar and Norfolk Island. On 28 July 1783 Matra sent Banks a letter from which quotation is made above. The friends discussed plans together, and on 23 August Matra addressed to the British government—then the Fox-North coalition—'A Proposal for Establishing a Settlement in New South Wales,' intended 'to atone for the loss of our American colonies.' He proposed to use American loyalists like himself as settlers, with two companies of marines and 20 'artificers, potters, and gardeners' as pioneers, and women from New Caledonia or Tahiti as pioneers' wives; stock could be procured from the Cape or the Moluccas; and the settlement could be made in peace-time a centre for trade with eastern Asia and in war-time a base of attack on the Dutch colonies of Malaysia or the Spanish colonies of South America. He quoted Banks as strongly in favour of his scheme, and in a sort of foot-note approved of a suggestion of Lord Sydney to send out convicts as colonists, but only on condition that they should be given land to cultivate immediately on arrival and never be 'reproached' for their former crimes.

Matra's proposals were thus not original. A draft of an anonymous scheme almost identical with his (and much more carefully argued) is in the British home office, and Sir G. Young (q.v.) had a plan of his own, although he readily supported Matra's. But the Proposal of August

1783 was the first publicly made, and attracted great attention, especially among the loyalists for whose benefit it was made; for instance, James de Lancey, who had been by far the greatest landlord in southern New York State, constituted himself an agent for procuring colonists among the loyalist refugees in Nova Scotia, and was exceedingly disappointed when the scheme fell through. For it did fall through. Lord Sydney, who after the collapse of the coalition in 1783 had charge of colonial affairs (such as they were), took no interest in loyalists; all he wanted was to relieve British gaols and hulks of their accumulation of prisoners sentenced to transportation, and his scheme was the one finally adopted. As for Matra, at Banks's urgent request he was made consul-general at Tangier in Morocco in 1786, and died at his post on 29 March 1806.

In many discussions of Matra's life and importance it has been stated that there is no direct evidence of the identity of Cook's 'Magra' with the Matra of the Proposal. It happens, however, that after his last appointment (to Tangier) Nepean, secretary to the admiralty, sent Pitt, his prime minister, a note on the new consul which gives the required identification; Matra, he says, 'is a native of New York, but was educated in England, and has always been employed on the King's service. He accompanied Sir Joseph Banks in his voyage with Captain Cook. . . .' It looks as if Pitt has been told that Matra came from New York, and had doubted his loyalty therefor. A list of the *Endeavour's* officers in the 1784 (folio) edition of Cook's *Voyages* also explicitly identifies Magra and Matra. Another interesting point about this man of mystery is his age and status when in the *Endeavour*. Cook in 1770 calls him a midshipman, whereas the admiralty list leaves him an A.B. up to May 1771, and he himself in 1790 claims to have had 30 years' service, so that he must have served for at least ten years before becoming a midshipman.



KEY TO PLATE XXVI.

FLOWERS OF EASTERN AUSTRALIA.

1. Waratah (*Telopea speciosissima*).
2. Christmas Bells (*Blandfordia nobilis*).
3. Christmas Bells (*B. flammea*).
4. Christmas Bush (*Ceratopetalum gummiferum*).
5. Flannel Flower (*Actinotus helianthi*).
6. Native Rose (*Boronia serrulata*).
7. Pink Boronia (*B. floribunda*).
8. Bottle-brush (*Callistemon lanceolata*).
9. Sturt's Desert Pea (*Clianthus Dampieri*).
10. Rock Lily (*Dendrobium speciosum*).
11. Cootamundra Wattle (*Acacia Baileyana*).
12. Sydney Golden Wattle (*A. longifolia*).
13. Wattle (*A. decurrens*).
14. *Hardenbergia retusa* ('Kongan' of Cooktown and 'Ru' of Batavia River).
15. *Dianella Tasmanica* (A Tasmanian Flax Lily).
16. *Piper Mestoni* (Meston's Pepper or Australian Pepper-vine).
17. *Delabrea Michieana*.

Mawson, SIR DOUGLAS, born at Bradford in Yorkshire on 5 May 1882, was brought by his family to Sydney while still a child, and educated at the Fort-street model school and the university of Sydney (B.E., Mining, 1901; B.Sc., 1904; D.Sc., Adelaide, 1909). In 1902 he was appointed demonstrator in chemistry at the university of Sydney, in 1903 carried out geological investigations in the New Hebrides, and in 1905 became lecturer in mineralogy and petrology at the university of Adelaide. He accompanied the Shackleton expedition of 1907-9 to the Antarctic (see ANTARCTICA) and with Edgeworth David (q.v.) succeeded in locating the magnetic pole. On his return to Adelaide he proposed an Australasian expedition to explore the unknown portions of the Australian antarctic quadrant, especially at the western end; he was supported by the Australasian Association for the Advancement of Science, and early in 1911 proceeded to England to make arrangements for the voyage. The *Aurora* (of the Newfoundland sealing-fleet) was refitted under the supervision of John Davis, who was to be her master, and a number of Greenland sledging-dogs were purchased. Mawson returned to Australia in July; at the end of November the party joined the *Aurora* at Hobart, and on 2 December set out for the south. The history of the expedition is narrated under ANTARCTICA. On 26 February 1914 Mawson and the rescue party returned direct to Adelaide. In 1915 he published *The Home of the Blizzard*, and was awarded the founder's medal of the Royal Geographical Society. He was then assigned to special war-work with commissions as captain (1916-18) and major (1918-19), and in 1920 was appointed professor of geology and mineralogy at Adelaide. In 1923 he was made a fellow of the Royal Society. (Kt. Bach., 1914; O.B.E., 1923.)

May, PHILIP WILLIAM (1864-1903), known as Phil May, was born at New Wortley near Leeds, England, on 22 April 1864, the seventh child of Philip William May. His paternal grandfather, Charles May, squire of Whittington near Chesterfield, and Master of the local Beagles, was a gifted amateur, who made clever

Drawn by Edith A. King.

FLOWERS OF EASTERN AUSTRALIA

(A Key to this Plate is printed with the article on Waratah)

caricatures of village worthies in water-colours. His maternal grandfather, Eugene Macarthy, a graduate of the university of Dublin, became an actor of some distinction, and was for a time manager of Drury Lane Theatre; a daughter (the sister of Phil May's mother) successfully followed her father's bent. Charles May of Whittington was a friend of George Stephenson, the famous locomotive engineer, to whom he apprenticed his son Philip. Philip May afterwards established a brass-foundry in London, but failed in business and died, leaving his family in distress. His widow returned to Leeds, where her son Phil spasmodically attended St. George's board school until his 12th year. He then worked as an errand-boy, first for a solicitor, then for an architect. For a time he earned half-a-crown a week, dusting pianos, but soon transferred his talents to the office of a timekeeper at a foundry. Through the good offices of a boyish friend, the son of a scene-painter, he obtained more congenial employment at the Grand Theatre, Leeds, where in his time he played many parts, mixing paints, helping to design costumes, and sometimes taking minor rôles. 'You should have seen me,' he afterwards said, 'play servants and guests and hind legs of donkeys.' A by-product of his activities at this time was a series of commissions to draw the portraits of players, for which he commanded as much as 5s. He also drew posters for the front of the theatre. 'I never had a drawing lesson in my life,' he once said, 'but I can't remember a time when I didn't draw.' In 1878, at 14, he was contributing drawings to a short-lived local paper, *Yorkshire Gossip*. He then joined a touring company, playing small parts and sketching posters at a salary of 12s. a week. Leaving this company after a couple of years, he continued his fortuitous career at Leeds till 1883, when at the age of 19, with a capital of £1, he sought his fortune in London.

During the next two years he contrived a precarious existence, seldom far above starvation level. To this period of his career many apocryphal anecdotes have been attached, but there is little doubt that, apart from an occasional guinea from such modest periodicals as *The Penny Illustrated* and *The Pictorial World*, and two guineas which Lionel Brough paid him for a caricature of the three famous actors, Irving, Bancroft and Toole, he received no encouragement to pursue his vocation. He returned to Leeds, ill, starving, beaten by London. Then he suddenly received from the editor of *St. Stephen's Review* a commission for a cover-design and certain illustrations for the Christmas number. His complete success in this work, however, did not bring him permanent employment until the spring of 1885, when William Allison, editor of *St. Stephen's Review*, gave him a position on the staff. So at the age of 21, after much tribulation, Phil May began to achieve his ambition. He was earning from £8 to £10 a week with *St. Stephen's* when, towards the end of 1885, after some negotiation with W. H. Traill, managing director of the Sydney *Bulletin*, he entered into a contract with that paper for three years at £1000 a year, and arrived in Sydney at the beginning of 1886 at the very outset of his remarkable career. Various reasons have been given to account for his coming to Australia at the time when he had begun to achieve success in London, which he loved with all his Bohemian heart. It can confidently be said that the primary reason was connected with his marriage, which took place not long after his arrival in Sydney. May remained in Australia nearly three years, leaving in October 1888, and contributed altogether to the *Bulletin* nearly 900 drawings, the last of which appeared in 1894. In 1892 he was back in London after a sojourn in Paris, where he had nominally been studying painting, for which he had little aptitude. His brilliant illustrations to *The Parson and the Painter*, which had appeared in book form in 1891, revealed his mature powers as a draughtsman and helped to establish his popularity. From this time onwards his output was great. *Phil May's Winter Annual* was published from 1892 until 1903, the year of his death. He did much excellent work for the *Daily Graphic* and various other illustrated papers. In 1895 he published *Phil May's Sketch Book*, and next year *Gutter-snipes*. In 1896 he joined the staff of *Punch*, and almost until his untimely death in 1903 continued to publish in that paper and elsewhere those brilliant topical sketches which have gained him so much fame and produced so many imitators, though scarcely a rival. He died at St. John's Wood, London, on 5 August 1903, and was buried at Kensal Green.

Phil May was a great draughtsman in his own right; he received no teaching; he belonged to no school—though he created one—and his style developed only in the sense that practice enabled him ever more fully to express his own individuality; in other words, improvement was due to increasing penetration of vision and increasing skill in the selection of significant lines (which were the only ones he finally left in a drawing), and not to the conscious influence of other contemporary styles. 'Sambourne's work was the only work,' he once said, 'that ever influenced me—in the sense that I saw how much could be expressed in a line; but I never set about copying anyone.' Yet, when he came to Sydney, May's style was quite immature, and the influence of Linley Sambourne is to be found chiefly in a certain statuesque stiffness, due perhaps to the complacency with which that draughtsman had accepted the limitations of the wood-engraver. It has been too often assumed from the shortness of his stay in Australia that it was a mere interlude in his career and had a negligible influence on his style. But when he returned to England in his 25th year, he revealed a mature and vivid style, marked by the strength, certainty, and rigorous selection of his almost living line. This was no mere accident though it has sometimes been attributed to a curiously accidental cause—the inadequacy of the printing-machines of the Sydney *Bulletin*. His remarkable development in Australia was rather due to certain other facts. (*a*) During these years he freed himself from the influence of such men as the *Punch* group—Du Maurier, Tenniel, and Sambourne—and of Baxter, the creator of Ally Sloper. (Baxter, by the way, had been invited to join the *Bulletin* staff before May.) This liberation was assisted by the advice of two very able draughtsmen on the *Bulletin* staff at that time, Livingston Hopkins and William Macleod. (*b*) May was engaged in Australia chiefly upon political cartoons, work which he seldom attempted later in England, and for which he had no liking; but the discipline—and Phil May constantly needed some discipline—greatly increased his insight into the essentials of character and assisted their brusque and emphatic presentation in a simple language of line easily understood of the people. More-

over, he collected many types in Australia which he continued to employ long after his return to England. His cover-design for the Christmas number of the *Pall Mall Budget* in 1894 is a genial presentation of Sir Henry Parkes as Santa Claus.

Soon after his return to London Phil May was deservedly acclaimed as the greatest master of his chosen medium. Whistler declared that he was the only black-and-white artist of genius in England, and, when asked what was the future of that art, he answered again—'Phil May.' The multitude of May's subsequent imitators proves the shrewdness of this dictum. Among his contemporaries the only artist in the same style who may aptly be compared with him is the great French illustrator, Steinlen, who has so brilliantly portrayed the daily life and amusements of the Parisian *ouvrier* and *boulevardier*. In the history of English black-and-white Phil May has been placed with Hogarth and Keene as the third of a great trio. Although the perilous carelessness of his life often seems to be imported into his art, the appearance is delusive. Few draughtsmen were more painstaking. Beautiful and meticulously drawn sketches were copied by means of tracing-paper on to Bristol-board, line after line being sacrificed in the process, until only the significant, structural lines remained, to be rendered finally in that decisive and vivacious manner for which he is so famous—the art which conceals art.

In his private life Phil May was the victim of his own geniality, but few men have been so well loved by their associates. He was, as the memorial tablet erected to him at Leeds in 1910 records, 'a great black and white artist' and 'a fellow of infinite jest.'

Phil May's books, other than those named above, are: *'Graphic' Pictures* (1897); *A.B.C. 52 Designs forming two Humorous Alphabets* (1897); *Songs and their Singers from 'Punch'* (1898); *Fifty Pen-and-Ink Sketches* (1899); *Phil May Album* (1899); *A Medley: Sketches in Colour and Black and White* (1903); *Sketches from 'Punch'* (1903); *The Phil May Folio: with a Biography* (1904); *Phil May in Australia* (Sydney, 1904); *Phil May Pictures* (1907); *A Picture Book* (1908); *Humorists of the Pencil: Phil May* (1908).

See *Dictionary of National Biography*, 2nd supplement, vol. ii; *The Times* of 6 August 1903; files of the Sydney *Bulletin* (1886-94).

J.F.B.

May-flies. See PLECTOPTERA.

Mealy-bugs. See COCCIDAE.

Mecoptera. See SCORPION-FLIES.

Meehan, JAMES (1774-1826), born in Ireland in 1774, was trained as a surveyor; for an offence committed in connection with the Irish rebellion of 1798 he was sentenced to transportation, and reached Sydney in February 1800. In April he was allotted as an assistant to C. . Grimes (q.v.), then deputy-surveyor-general, whom he accompanied in 1801 to the Hunter River and in 1802-3 to King Island and Port Phillip, thus being one of the first white men to stand on the site of Melbourne. In October 1803 Governor King sent him to make surveys for Bowen at Risdon Cove in Tasmania; but six months later he was brought back to Sydney to fill the place of Grimes, who had gone on leave in August 1803.

From this time until his retirement in 1822 Meehan carried out all surveys for land-grants —a duty which involved a number of genuine explorations in new country, one of which took him across very rough country between Moss Vale and Wellington in 1820. King recognized his meritorious work by the grant of a conditional pardon in June 1805, and of a full pardon exactly 12 months later. On Grimes's return in 1806 Meehan was sent to Hobart; but the next year, when Grimes was ordered to England by Colonel Johnston, Meehan returned to New South Wales and worked there as acting-surveyor-general till Macquarie's arrival. His map of Sydney, published in 1807 and reproduced in vol. vi of the *Historical Records of New South Wales*, is a record of great value. For his services Foveaux (q.v.) made him a grant of 130 acres at Bankstown. Macquarie (whom he accompanied to Tasmania in 1811) was greatly impressed by his excellence both as a surveyor and as a man, and appointed him deputy-surveyor-general in 1812 under Oxley, with whom he worked amicably and strenuously until 1821. In that year—probably because Macquarie himself was retiring—he sent in his resignation, with an appeal for a pension which was strongly endorsed by Macquarie and Oxley; £100 was granted, but he did not enjoy it for long, dying on 26 April 1826 near Liverpool in New South Wales.

The value of his 22 years work in the colony is sufficiently proved by the eulogies of Oxley, Macquarie ('there is not a more useful officer serving under this Government. . . his honour and integrity are unimpeachable'), and even Bigge, who was prejudiced against him as an ex-convict, coupled him as an explorer with Oxley and Evans—praise which (as reference to the article on EXPLORATION BY LAND will show) is over-stated, though in the minor explorations of 1815-21 he had played a considerable part. For an account of his exploration between the Wingecarribee, Shoalhaven, Macquarie, and Murrumbidgee rivers see *Journal and Proceedings* of the Royal Australian Historical Society (vol. vii, Sydney, 1921).

J.W.

Megaloptera, an order of insects dating from early geological times, but represented at the present day by little more than 200 species, of which (so far) only three have been described from Australia. There are two sub-orders, the Sialoidea (alder-flies), whose larvae are aquatic, and the Raphidioidea (snake-flies), whose larvae live under the bark of trees. These latter are not found at all in Australia. The larvae of alder-flies may be recognized by the possession of a series of paired lateral appendages on the abdomen; these appear to function as gills. The pupa lies free in the earth. The imagines closely resemble lacewings in structure, but may be distinguished by the absence of the terminal splitting of the veins which is so characteristic of the Planipennia. The order Megaloptera is, however, only doubtfully distinct from the Planipennia, the two groups of insects being very near akin.

The Corydalidae consist of large insects whose larvae have an abdomen terminating in a pair of hooked claspers. A single species, *Archichauliodes guttiferus*, is not uncommon in most parts of Australia, its larva being found under rocks in mountain streams. The Sialidae are smaller, and resemble caddis-flies in appearance, but have the mandibulate mouth-parts complete; the abdomen of the larva terminates in a single caudal filament. Two species,

Austrosialis ignicollis (plate xix, fig. 23) and *Stenosialis australiensis*, have been described, the former from Tasmania, the latter from Mount Tambourine near Brisbane. A smaller species of the last-named genus is not uncommon around Sydney, but has not yet been described. These species are related to Chilean forms.

See Tillyard in the *Proceedings* of the Linnean Society of New South Wales (1918). R.J.T.

Megapodiidae. See MOUND-BIRDS.

Melaleuca, an almost exclusively Australian genus of plants of the family Myrtaceae, mostly shrubs and small trees, known as tea-trees, and usually found in marshy places. The flowers are red, crimson, white, or yellow, in heads or spikes; where spikes (bottle-brushes) occur, the shoot grows through and beyond the flowers, and the fruits form in a cluster round

M. leucadendron.

the branch. The calyx-tube is bell-shaped, with imbricate lobes; petals five, orbicular; stamens united into five distinct bundles, the united part being flattened; capsule enclosed in the hardened calyx; leaves opposite or alternate. Each season a new set of capsules is produced, but they remain attached to the branches for two or three years to give the seeds time to ripen. From *M. leucadendron* comes the cajuput oil of commerce, and several other species yield essential oils of greater or less value. *M. ericifolia*, a shrub, covers large areas of marshy land in most of the southern States; in Tasmania it becomes a tree, reaching a height of 70 feet with a girth of 4-5 feet; its bark was used by the natives of Tasmania for making canoes, sheets being stitched together with the outer skin of a sort of marsh-mallow, *Sida pulchella*. Near Sydney there exists a purplish-flowered variety of this species. *M. armillaris* makes a good protective hedge in exposed situations, and several of the white-flowered species are highly ornamental. The smaller species display a profusion of pretty flowers, and some coastal species which attain tree-size are rounded and beautiful in shape. Most species have small, neat leaves; *M. leucadendron* is typical of the section with comparatively large lanceolate leaves.

The timber of most species of *Melaleuca* is exceptionally well-suited for posts in wet ground, or for boat-building, since moist conditions do not readily affect it. From the papery bark of several species the aboriginal women made a creel for carrying their babies in; it is impervious to water, and durable, and has been used for bottle-stoppers, for lining boots and shoes, and for packing fruit for export (but with indifferent success so far). This bark has also been used in conjunction with timber in making dams, and has been found still sound when the timber had decayed.

Melanesia, MIGRATIONS IN.—This is probably the most complicated ethnological region in the world, since it has the most diversified environment and yet is near to what is generally accepted as the centre of dispersion in Asia. Hence the later races have pressed out into the island areas, while the older races have been preserved, on many of the larger islands, only in isolated mountain areas clothed with tropical jungle. The table on page 50 shows the major races with their ethnological characters; the early primitive races are given below, and the younger, more advanced races above. The numbers correspond to those on the migration-zones in the accompanying map.

Cephalic index is taken as the first criterion in establishing ethnical types. Such a classification splits up the eastern island-peoples (Polynesians)—e.g. Maoris and Samoans—into different classes, and allies the Maori with the Massim of Melanesia. This is logical, since the term 'Polynesian' is based on habitat, language, and culture rather than on anything physical; and we should not classify Booker Washington as a non-negro because his culture and language are exactly those of the educated western European.

As regards some of the lower races classification is not so difficult; the negrito and Australian groups are distinctive, and the Papuan races have fairly definite characters. But the so-called Melanesian peoples are especially hard to classify satisfactorily. Finally, the higher races on the frontiers of Asia are late-comers into the Australasian region, and can be correlated with certain Asiatic types with some certainty.

The negrito peoples are scattered through a belt of 'marginal' habitats from the Andaman Islands to Tasmania. With the exception of these two extreme regions, all their localities may be described as 'inliers.' In other words they have been almost overwhelmed by succeeding immigrations, which have in every case driven them into forested highlands. The Mincopi people of the Andamans in the Bay of Bengal, and the Tasmanians, were preserved up to recent times by their isolation in islands about 200 miles from the mainland. In the map given on page 51, the main corridor, used probably by all the early peoples, extends from Siam towards Papua and Cape York. In Pleistocene times this traversed level plains for much of its

course. Since then, Sunda-land (north of Java) and Sahul-land (west of Darwin) in the north have vanished, and in central Australia the 'corridor of migration' has in all probability greatly deteriorated in attraction. The present habitat of the negritos is found to lie off the main 'corridor,' in general far to the east, in the high ranges which once bordered fairly continuous East Indian lands. Each group of these peoples branched off from much the same main corridor; probably, therefore, the Tasmanians separated from the negritos now living in Melanesia (the region from New Ireland to New Caledonia) somewhere near Timor or Celebes. So also the Aeta of the Philippines probably branched off from the main corridor near western Borneo.

GENERALIZED SCHEME OF RACES IN THE AUSTRALASIAN REGIONS.

No.	Race.	Types.	Cephalic Index.	Hair.	Stature. Inches.	Skin.	Nose.	Culture.
6	Indonesian ...	Javanese	83-85	straight to wavy.	63	brown ...	mesorrhine.	metals, weaving, &c.
5	Later Polynesian ...	Samoan, Tahitian	76-84	,, ...	68	light brown.	,,	
4a	North Melanesian...	Massim	77	wavy ...	65	dark brown to black.		
4	Mid-Melanesian ...	North Solomons ...	75	,, ...	63	,, ...	platyrrhine.	neolithic, megaliths, couvade.
3	Australian ...	Arunta Kamilroi ..	73	,, ...	65	chocolate	,, ...	neolithic, primitive weaving, no metals or pots.
2a	South Melanesian ..	New Caledonia ...	72	frizzy ...	65	dark brown.	,,	
2	Papuan	West Melanesia, West Papua.	71	,, ...	63	,, ...	,,	
1	Negrito	Aeta, Tapiro, Tasmanian (in part).	Variable ..	,, ...	58	,, ...	,, ...	very primitive, palaeolithic.

In Melanesia negritos remotely allied to the Tasmanian aborigines occur in very small groups in the interiors of the largest islands. In many cases the pure-bloods have become practically extinct, and the chief evidence of a former negrito settlement is the presence of tribes of smaller stature than usual, often with rather higher head-indices than those of the surrounding tribes. Indeed, as the negritos of this region become less pygmy-like their head-index decreases, as the following table shows:

Group.	Tribe.	Cephalic Index.	Stature.	Hair.	Skin.
			ft. in.		
Asiatic Negrito ...	Aeta (Philippines)	79·6	4 9	peppercorn	chocolate.
	Mincopi	82·1	4 11	,, ...	black.
	Semang (F.M.S.)...	76	5 0	,, ...	chocolate-brown.
	Tapiro	79·5	4 9	frizzy ...	yellow-brown.
Mixed types ...	Sakai (F.M.S.) ...	79	4 11	wavy ...	black.
	Tasmanian ...	74·77	5 5	frizzy ...	dark brown.
	Veddah (Ceylon) ...	73·75	5 1	wavy ...	chocolate.
(For comparison)...	Australian ...	73	5 5	wavy ...	chocolate.

The most probable explanation is that we are dealing here with two original stocks, best illustrated by the Australian and the Aeta, and the Tasmanian is probably a half-caste between the two. He has the stature of the Australian, the hair of the Aeta, and an intermediate cephalic index. The Tapiro negritos have been investigated by Wollaston (see his *Pygmies and Papuans*). They live just to the south-west of Mount Carstensz in Dutch New Guinea at a height of over 7000 feet. Austen has found somewhat similar folk in the west of the British territory. They are active little fellows with big buttocks and big calves, quite unlike the Papuans in the swampy coast-lands below them. The nose is straight but very wide; the upper lip long and curiously convex; the hair short, woolly, and black—the men have short, bushy, black beards. Their weapons are bows and arrows, flint knives, and daggers made from cassowary bones. Instead of mere wind-breaks, their houses are built on piles and made of lath and bark. They are therefore much ahead of the Tasmanians in culture.

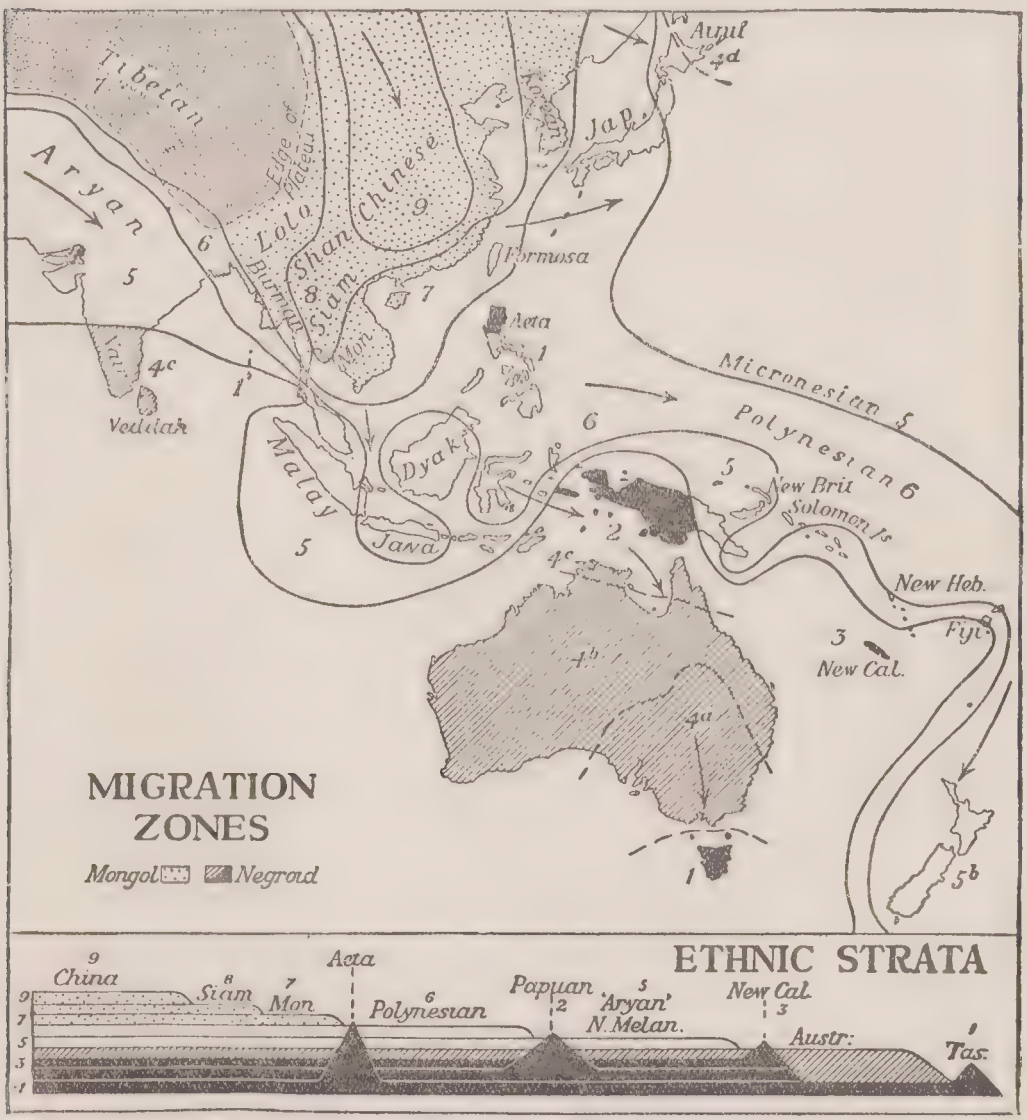
Quite distinct from the Australian aboriginal in many ways is a group of people whose present range is from Flores (400 miles east of Java) and the Moluccan islands on the west to Fiji and New Caledonia on the east. They are shown as zones 2 and 3 in the map.

In Melanesia they are found chiefly in the southern and western isles. In all cases the skin is very dark, in some parts even sooty in colour; the hair is extremely frizzy, the nose often hooked and Jewish in appearance, the face long, and the skull markedly dolichocephalic (73). There is often a well-marked brow-ridge (torus). In this ethnological division there is a well-defined linguistic distinction between the peoples of New Guinea in the west and those inhabiting Melanesia to the east; the easterners' languages belong to a common Melanesian stock, the westerners speak quite different and very varied languages, which are described for convenience as Papuan. (Similarly in Africa the Bantu negroes use varieties of a common Bantu language, whereas the Sudan tribes, otherwise somewhat similar, speak innumerable alien tongues.) Judging by analogy, we may consider all these long-headed negroes as of

similar origin, and as migrating from Asia about the same time; but possibly those living in the small islands came under the influence of a great migration of later comers (the higher 'Melanesians') who spoke a new tongue which the primitive island folk adopted.

The salient feature of primitive Melanesian organization is the division of each tribe into two exogamous groups, each possessing a totem (which we may briefly describe as the tribal symbol); often one totem is light-coloured and the other dark. This may commemorate a racial mixture of aboriginal dark peoples with invaders less dark. Marriage takes place only between members of different groups, hence the name of 'primitive dual-group' Melanesians is given to this stock. Descent was usually reckoned through the mother. Body-scars (keloids) are thought to improve the appearance, just as in Australia. Magic plays a very large part in their lives, and they inter their dead in a crouched position. Secret societies of a complex nature terrorize the community, in which a ritual of masks and bull-roarers shows a culture-stage little different from the Australian (see ABORIGINES).

Living almost side by side with the primitive dual-group peoples is a much higher race, which has unfortunately also been classified as Melanesian. They have few characters in common, though certain transition types are to be expected. The cephalic index is 76, as opposed to 73; there is no exogamy, and the physical features are much more refined. These higher races are smaller and lighter in colour; the skin ranges from bronze to *café-au-lait*; the hair is usually rather frizzy, but may be ringleted or wavy. The usual beverage is kava, prepared by macerating a root like ginger; much ceremony accompanies kava-drinking. In many respects



Migrations of aboriginal peoples into the Australasian area. The southern peoples (with lower numbers) are the more primitive. The section shows diagrammatically how the later peoples have overwhelmed the more primitive tribes.

they resemble the primitive peoples of Europe, the Ibero-Mediterraneans. Thus they tattoo in almost all the tribes, indulge in skull-hunting, build stone monuments, and observe the curious custom of the 'couvade,' whereby on the birth of a child the father takes to his bed for a space of days or weeks and abstains from certain foods and practices. All these customs characterized the earlier western Europeans (Irish, Basques, Corsicans, etc.) and may be traced in the earliest descriptions of them when in a state of barbarism.

These higher Melanesians are chiefly found in the northern and eastern islands. Dolmens and stone circles mark their migrations, and occur in New Britain, in eastern New Guinea, in the Solomons, and in the New Hebrides. We can only trace the Melanesian migration from anthropometric or cultural evidence. Their legends are of no such value as those of the Polynesians, for instance. Almost everywhere where Polynesians settled we find traces of the lower races, and it seems likely that they or their allies wandered from Madagascar to Easter Island; for some authorities consider that certain negroid tribes who preceded the Hovas (an early Indonesian race) in Madagascar also came from the East Indies. As regards Easter Island, although it lies 5000 miles to the east, the evidence advanced in Mrs. Routledge's *Mystery of Easter Island* (London, 1919) shows that the slit-eared statues differ little (except in size) from similar figures in Melanesia. Their bird-cult recalls that associated with the frigate-bird in the Solomons.

The Polynesians comprise several ethnic stocks allied in much the same fashion as are the Alpine and Nordic peoples of Europe; they have a common language, culture, and environment, but are not in a physical sense people of the same race. There is the greatest difference between the dark, medium-sized, leptorrhine, long-headed Maori and the fair, tall, somewhat platyrrhine and very brachycephalic Samoan. Physically, the former approaches the western European, the latter is nearer the so-called Mongolian; and this resemblance is no accident, but illustrates an important general principle. In effect, while one group of peoples was migrating to the western periphery of Asia (e.g. Britain), an allied group was migrating to the south-east, and reached about the same position with regard to central Asia (e.g. outer Polynesia). Thus we find the peripheral folk of Hawaii (in the north-east) and New Zealand (in the south-east) linked together in certain physical and cultural aspects. Both peoples have heavy beards—which are absent in most Polynesians. Indeed it is almost impossible to distinguish some Hawaians and Maoris from certain dark Europeans.

The Polynesians are as a whole some of the tallest people in the world; 5 feet 10 inches is quite a usual height. The higher Polynesians have often a very light brown skin; Hawaians and Maoris are a much darker brown. The hair is wavy to straight and of the same type as European hair, but always black in colour. There is a tendency to obesity. The face has regular features—so much so that many of the women are quite beautiful. The eyes are black. Tattooing is common, and has reached its greatest development in New Zealand. The Igorots of the Philippines, and many of the highest Melanesian folk of New Guinea (whom the writer places in the same zone), were their rivals in this respect.

There is little doubt that the Polynesian peoples represent a disrupted zone of races who originally inhabited south-eastern Asia. Judging by the general laws of migration, we should expect to find their congeners still living in the highlands of India and Burma on the one hand, and in Manchuria or thereabouts on the other hand; many allies might be expected in America. This is precisely what we find when we examine the physical and cultural evidence. We may picture a time—perhaps reaching back to the early Neolithic period—when the Polynesians and other tribes at the same stage of evolution occupied eastern Asia. Later on, during thousands of years, the Polynesians were slowly pushed to the sea by the Chinese and allied folk. For centuries the Polynesians occupied eastern China and Further India, and no doubt became expert navigators. Intense desiccation in central Asia drove out most of the 'Mongolians,' and they spread down into the coast-lands, probably about 5000 years ago. The Polynesians then abandoned the mainland and migrated eastward; a few went south and settled in the Mentawei isles of Sumatra (for here the Nias tribes speak a Polynesian tongue), but most kept north of Indonesia, and swept to the east without occupying islands already fairly fully occupied by the lower races (Negroes, Australians, and Lower Malays).

In Melanesia the Polynesian wave (as shown on the map) broke upon the eastern flank. Outlying colonies are found in the south of the Solomon Islands, as on Rennell Island. Tucopia, to the south-east, is Polynesian in type. So also in the southern islands of the New Hebrides (from Efate to Tanna) there have apparently been settlements. Off New Caledonia the people of the Loyalty group are largely of Polynesian stock. The Maoris are referred to above.

Gr. T.

Melba, Dame Nellie (Helen Porter Armstrong, *née* Mitchell), was born at Burnley near Melbourne on 19 May 1861 and attended for a time at the Presbyterian Ladies' College, Melbourne. She developed musical leanings at a very early age, but was uncertain of their direction. At first she took lessons in pianoforte-playing from Madame Charbonnet-Kellermann (mother of Annette Kellermann the swimmer); at her school she was taught singing on the supposition that she was a contralto. But Pietro Cecchi, who taught her from 1879 to 1886, decided that she was a soprano, and cultivated her voice on those lines. In 1882 she married Charles Armstrong, son of a Queensland squatter, and soon afterwards—against the wishes of her family—took up singing at concerts and toured eastern Australia with Charles Huenerbein, meeting with little success. In 1886 she left Australia for Paris, where Maurice Strakosch was struck by the quality of her voice and helped her to obtain tuition from Madame Marchesi, then the foremost vocal teacher of western Europe. On 15 October 1887 'Nellie Melba' (the name is, of course, an adaptation of that of her birthplace), made her début at the Théatre de la Monnaie in Brussels as Gilda in *Rigoletto*, and on 24 May 1888 appeared under the direction of Sir Augustus Harris at Covent Garden as Lucia in *Lucia di Lammermoor*. During the season she sang the rôles of Juliet (*Romeo et Juliette*), Elsa (*Lohengrin*), and Marguerite (*Faust*), and by the end of it had established herself as a great singer, though her acting was considered 'cold.' In 1889 she re-

peated her success at the Paris Opera House and in 1890 at the Milan Scala, thereafter touring Holland and Scandinavia. In 1891 she appeared in Russia and Italy. In 1893-4 she toured the United States, and at the end of 1894 returned to Covent Garden. During these years she was still experimenting with her voice, attempting both Italian and Wagnerian parts; but her appearances in Wagner operas were rarely successful, and from 1894 on she wisely restricted herself to lyric rôles. In 1902 she revisited Australia to give a series of concerts, which suffered a good deal from her extraordinary temperamentalism; her voice, however, was at its best, and her reception when she sang was thoroughly appreciative. Returning to Europe, she achieved triumph after triumph, being reckoned the undoubted queen of the lyric stage. In 1911 she arranged with J. C. Williamson and Co. to bring to Australia a Grand Opera Company which played to crowded houses in the capital cities. During the war she raised by concerts and other means over £100,000 for Red Cross purposes in the United States, Canada, and Australia. After the war she returned to Covent Garden, and in spite of a serious illness in 1922 brought a second opera company to Australia in 1924; on 13 October 1924 she bade farewell to the operatic stage in Australia at a gala performance of *La Bohème* in Melbourne. Her farewell to Covent Garden audiences took place before the King and Queen on 8 June 1926, when her items included the balcony scene from *Romeo and Juliet* with Charles Hackett as Romeo. (D.B.E., 1918.)

See her autobiography *Melodies and Memories* (London, 1925) and Murphy (Agnes G.) *Melba: a Biography, with chapters by Madame Melba on the selection of Music as a profession* (London, 1909).

Melbourne, the capital of Victoria and in population the second city in the Commonwealth, did not, like other Australian capitals, originate under official auspices. It owes its birth to the enterprise of some settlers from Tasmania, where the country available for pastoral purposes was becoming overstocked. In May 1835 John Batman (q.v.), as agent for the Port Phillip Association, crossed the straits from Launceston in the schooner *Rebecca,* and explored westward and northward of Port Phillip. He fell in with a wandering band of blacks, from whom he 'purchased' 600,000 acres of land, giving blankets, tomahawks, flour, etc. in payment; and having established a depot at Indented Head, near the entrance to the harbour, where he left some of his men, returned to Tasmania to prepare for a transfer to the new country. A few weeks later an independent party organized by John Pascoe Fawkner (q.v.) entered Port Phillip and made their way up the Yarra to the site of Melbourne, where they established a camp about the beginning of September 1835. Here they were found by John Helder Wedge (q.v.), a member of the Port Phillip Association, who had come over to inspect Batman's 'purchase;' as they refused to move from what Wedge considered to be the association's territory, he brought some of the Batman party up from Indented Head to camp alongside of them.

Not only was there a personal dissimilarity between the two leaders, Batman and Fawkner; there was as much between their respective associations. Batman's was composed of business men, ex-civil-servants, pastoralists, and professional men, while Fawkner's party was made up of tradesmen, mechanics, and labourers. Among Batman's associates were Charles Swanston (a banker), J. T. Gellibrand (a lawyer), John Helder Wedge (a surveyor), J. and W. Robertson (drapers), James Simpson (a police magistrate), John Thomas Collicott (a postmaster and auctioneer), and other men prominent in Tasmania. Batman brought over the first doctor, the first preacher, and the first school-teacher. In Fawkner's party there were Samuel Jackson (a contractor who became one of Melbourne's earliest architects), George Evans (a plasterer and builder, who built the first sod hut), Robert Marr (a carpenter), and James Gilbert (a blacksmith). Charles Wise, one of the party, ploughed the first field cultivated in Port Phillip. The one party seemed to be the complement of the other. Thus was the nucleus of Melbourne formed.

Governor Bourke, as in duty bound, repudiated the validity of Batman's purchase from the natives, and condemned as trespassers those who had dared to intrude upon crown lands 'without the licence or authority of His Majesty's Government;' but in a despatch to Downing-street he expressed the opinion that it would be 'more desirable to impose reasonable conditions on Mr. Batman and his associates than to insist upon their abandoning their undertaking.' In May 1836 he sent a police magistrate to inspect the new settlement, which then consisted of 'three weather-boarded, two slab, and eight turf huts;' and in the following September, having obtained the approval of the colonial office, he despatched thither an official party under Captain William Lonsdale, who was to act as resident magistrate. This party included surveyors who were to map out the shores of the harbour, trace the courses of rivers, and subdivide the district for purposes of sale.

In March 1837 Bourke visited the settlement and authorized the laying out of a town on the site the settlers had selected; Lonsdale preferred a site at the mouth of the Yarra, but lack of a water-supply at the time made it ineligible. Bourke seems to have in his own mind agreed with Lonsdale, for to the Yarra-mouth site he gave the name Williamstown after the reigning monarch, whereas the more inland site was named Melbourne after the then prime minister of England. The infant town had no lack of names; the Tasmanian newspapers called it 'Batmania' and 'Glenelg'—the latter on the analogy of Sydney and Hobart, after the British secretary of state for the colonies; and Stewart wrote of it as 'Bearbrass,' while other contemporary references give the forms 'Bearport,' 'Bareheep,' and 'Bearbury' all apparently variations of the native name of the locality, which was 'Berrern' or 'Bararing.'

The infant town was laid out on a rectangular plan, with streets intersecting at 10-chain intervals. Though Robert Russell had surveyed the district, it was due to the foresight of Robert Hoddle (q.v.) that the streets were made 99 feet wide, though at that time one chain (66 feet) was considered the correct width for a main road. To Hoddle Melbourne owes also the boulevards of St. Kilda-road running southwards, Victoria and Wellington parades running eastwards, and the Flemington and Sydney roads running northwards from its outskirts. The names of the streets recall early history. Flinders-street is named after Matthew Flinders, who was the second commander to enter Port Phillip; Collins-street after Captain David Collins, who founded the first settlement in Port

MELBOURNE AND SUBURBS.

Phillip—Hobart Camp, which lasted only a few months, on the site where Sorrento now stands—Bourke-street after Bourke himself; Lonsdale-street after Captain Lonsdale. Latrobe-street was named later, after the first superintendent and governor. The direction of these streets is not due east and west, but rather in line with the Yarra. The original town went only as far north as Lonsdale-street, though in the other direction it ran to the full extent from Spencer-street to Spring-street. Spencer-street was named after Lord Spencer, who was in Melbourne's cabinet; King-street after Governor King; William-street after the reigning monarch, and Queen-street after his queen; Elizabeth-street after the wife of Richard Bourke; Swanston-street after Captain Swanston, a pioneer and a member of the Port Phillip Association; Russell-street after Lord John Russell; Stephen-street (now Exhibition-street), after an under-secretary at the colonial office; and Spring-street after Spring Rice, the chancellor of the exchequer. Between these streets were laid out narrower lanes, such as Flinders-lane and Little Bourke-street; this arrangement has proved to be an error, conducing to a congestion of modern traffic which calls for drastic remedies in the future. The first sale of town allotments took place on 1 June 1837, just two years after Batman's landing.

Melbourne was founded at a particularly auspicious moment. Pastoralists from Tasmania were already spreading their flocks and herds over the western plains of the Port Phillip district, and 'overlanders' pushed across the Murray from the north as soon as the opening of a new port was assured. By 1841 a vigorous and thriving community of over 4000 souls had been established on the Yarra, and a demand had arisen for the separation of the district from New South Wales. Melbourne was incorporated in 1842, and by 1845 permanent government offices, a customs house, post-office, court-house, several churches, and a theatre had been erected; the town became a city on the arrival of the first bishop of Melbourne (Charles Perry, q.v.) in 1848. The census of March 1851 showed a population of over 20,000. A few months later the discovery of gold at Castlemaine, Ballarat, and Bendigo gave an impetus to the colony's development which crammed into half-a-dozen years the normal growth of a generation. Melbourne soon surpassed even Sydney in size, and for more than 40 years was the most populous city in Australia.

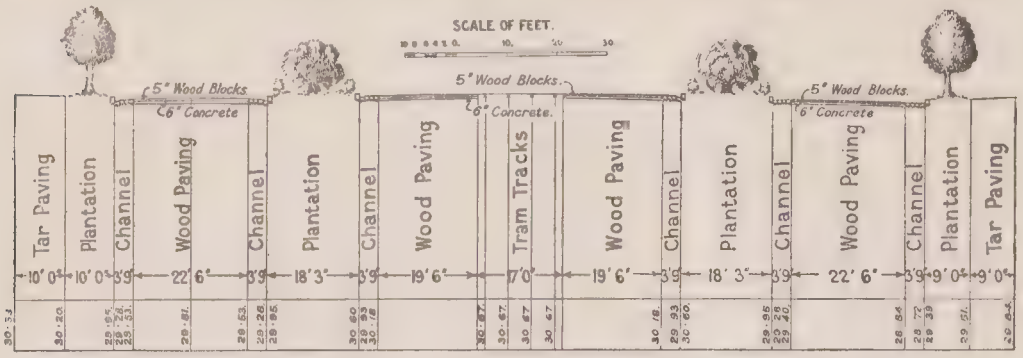
The rush of gold-seekers in 1852 and 1853 rapidly overcrowded the town and encircled it with encampments of immigrants unable to find house accommodation. The most famous of these was 'Canvas Town,' on rising ground south of the Yarra. In 1854 the foundation-stones were laid of a university and a public library; a railway (the first in Australia) was opened from Melbourne to Sandridge (now Port Melbourne); telegraphic communication was established with Williamstown on the opposite shores of Hobson's Bay; and in a miniature 'Crystal Palace,' erected in ten weeks, the first Melbourne Exhibition was held. The streets were provided with metalled roadways and paved foot-walks, and in 1857 were lighted by gas; and the completion, about the same time, of the Yan Yean system provided the citizens with a water-supply, for which they had hitherto been compelled to rely upon the Yarra. To this period also belongs the growth of the coaching business, with which was associated for so many years the name of Cobb & Co. (see RUTHERFORD, JAMES). Before the end of 1851 coaches from Melbourne to the goldfields had been run by two hotel-keepers located at Bacchus Marsh; but it was Freeman Cobb and his American associates who in 1854 laid the foundation of the famous Australian coaching system, though Cobb himself left Australia in 1856.

The expansion of the suburban area was a natural concomitant of the enormous influx of population. Williamstown, situated at 'the anchorage' on the western shores of Hobson's Bay, was the first suburb, its foundation being contemporaneous with that of Melbourne. The sale in 1839 of 25-acre blocks lying east and north-east of the town gave rise to 'Newtown' (subsequently named Fitzroy and Collingwood) and Richmond. 'Liardet's Beach' at the mouth of the river, across the bay from Williamstown, boasted a couple of public-houses and a few fishermen's huts by the end of 1840, and from this beginning developed Sandridge, now Port Melbourne. The watering-places of St. Kilda and Brighton were established in 1841 or 1842; about the same time the first stopping-place on the northward road to Sydney acquired the name of Brunswick; a few years later the brick-making industry, which had previously flourished on the south bank of the Yarra, was transferred thither and Brunswick began its career as an industrial suburb. The foresight of early survey authorities had made provisional reserves of park-lands north, east, and south of the town (progress on the west being blocked by the existence of 'Batman's Swamp'—now excavated to make the Victoria dock), but in 1852 these reserves were to some extent encroached upon by the laying-out of the inner suburbs of Carlton, Parkside (now North Melbourne), and Emerald Hill (now South Melbourne). Communication with the southern side of the river was established by the erection of bridges in 1846 and 1850 (see LENNOX, DAVID); in the fifties the parish of Prahran began to lose its rural character, and on the high banks of the Yarra, opposite Richmond and Collingwood, the fashionable residential areas of Toorak, Hawthorn, and Kew came into existence. North-west of Melbourne, on the highway to the goldfields (the Mount Alexander road), sprang up Flemington and Essendon, the former adjoining the race-course on which the Melbourne Cup has been run ever since 1861; and between Flemington and Williamstown was established the manufacturing district of Footscray. In 1855 and 1856 Collingwood, Richmond, Prahran, St. Kilda, South Melbourne, and Williamstown were proclaimed separate municipalities, and by 1861 railway communication was established with St. Kilda, Richmond, Hawthorn, Prahran, Brighton, Essendon, and Williamstown.

Progress in the sixties and seventies was steady, if not spectacular. The earlier churches were gradually replaced by edifices of a size and dignity more in accord with the importance of the city; a vice-regal residence (imitated from the royal residence, Osborne in the Isle of Wight (was erected in the Government Domain south of the Yarra; the Elizabeth-street post-office, the law-courts, and a branch of the royal mint were built, as well as the treasury and government offices at the eastern end of Collins-street; a new town-hall arose on the site of the old blue-stone building erected during the 'gold-rush' times. An organized omnibus service on American lines supplemented the cars and wagonettes which plied for hire in the

streets; the improvement of the Yarra's winding course was seriously taken in hand.

The decade 1880-90 was marked by substantial progress. Population increased from 282,000 in 1881 to 490,000 in 1891. Two great international exhibitions were held (in 1880 and 1888) in a building specially erected in the Carlton Gardens. Telephones and electric light were introduced in the early eighties, underground drains were constructed to carry off storm-water (which had hitherto proved very troublesome in the low-lying part of the town),



Cross-section of St. Kilda-road, Melbourne.

and wood-paving began to replace macadamized roadways. Blocks of office buildings, eight and nine storeys in height, towered over the older structures whose maximum was three or four. In 1885 was inaugurated the system of cable tramways which, after serving Melbourne for 40 years, was only in 1925 being supplanted by electric traction (though in the suburbs that system had prevailed for some years). The course of the Yarra was widened and straightened so as to eliminate floods, which had been a constantly recurring trouble up to 1891; and between 1885 and 1889 two new bridges—Queen's Bridge and the present Prince's Bridge—were thrown across the river. Fresh suburban areas were also developed east and south-east of the town, following on the expansion of the railway-system. The linking up in 1879 of the Gippsland line with that from Brighton supplied railway communication to the now populous areas of Malvern and Caulfield; the opening of the Box Hill railway in 1882 brought into being the 'eastern suburbs' of Camberwell, Canterbury, and Surrey Hills in what had been the dairy-farming and market-gardening district of Boroondara.

Later improvements include the inauguration of a sewerage-system in 1891; the erection of the central railway station in Flinders-street (which now deals with over 13 million passengers a year) between 1904 and 1909; the introduction of electric tramway services in the suburbs, which commenced in 1906; and the electrification of the suburban railway-lines, on a scheme initiated in 1918. The population of Melbourne, which stood still for a time after the collapse of the 'land boom,' and had not quite reached half a million at the close of last century, was estimated at the end of 1925 to be 912,130, spread over an area of about 250 square miles.

Among Melbourne's early merchants were such enterprising spirits as Craig, Jackson, Rucker, Welsh, Graham, Nodin, Heape, and Grice. The better part of the town was then (as it is not now) in the west; business naturally settled itself in the centre of the city. Doctors began to affect Collins-street in the forties, and Collins-street-east is now almost devoted to that profession. Collins-street-west, with Queen-street, has became the home of the banks, insurance companies, and similar institutions. Flinders-lane (commonly known as 'the Lane') houses the chief importing firms. The principal shopping thoroughfares are Bourke-street, Swanston-street, Elizabeth-street, and 'the Block' in Collins-street.

In and about Melbourne there are fine examples of modern road-construction. The main St. Kilda-road, which runs from Prince's Bridge to St. Kilda, consists of a series of roads and footpaths, separated by ornamental plantations of palms and trees. The overall formation is three chains wide, made up of a central wood-blocked roadway 63-ft. 6-in. wide, carrying a double-track tramway; two 30-ft. carriage-ways also wood-blocked; and footpaths of tarred paving, one 10-ft. and one 9-ft. wide. The plantations have an aggregate width of 55-ft. 6-in., the two central ones being each 18-ft. 3-in. wide, and the two bounding the footways 10-ft. and 9-ft. respectively. The Sydney-road running north from Melbourne is also three chains wide over all, with four plantations of ornamental trees, but the trees are planted in openings set back in the footways six feet from the kerbing. The central roadway is 53-ft. wide between the 15-ft. wide plantations; is wood-blocked on six inches of concrete, and carries a double-track tramway. On each side of the plantations are carriage-ways, 24-ft. wide between kerbs. The footways, which are ornamented with shade trees, are exceptionally wide, being 33-ft. 6-in. each.

The monument which formerly stood over Batman's grave in the old cemetery has been transferred to Batman-avenue near the banks of the Yarra. Batman founded a free city, and it was kept free. John Charles King, the first town clerk, was sent to England to memorialize the British government against transportation. When Governor FitzRoy was on a visit to Melbourne the *Randolph* came in with transported convicts, but Latrobe refused to allow them to land, and FitzRoy saw that he could not force such denizens upon Melbourne.

Although built on gently undulating country which readily lends itself to schemes of beautification—as is exemplified in the magnificent botanical gardens on the south side of the Yarra—the city is surrounded by a coastal

plain which provides no inspiring natural scenery, and the harbour of Port Phillip has no beauty-spots comparable to those of Port Jackson. But the Dandenong ranges, lying 20 miles to the east, are easily accessible by railway, and among the foothills in the Plenty Ranges to the north, and along the timbered reaches of the upper Yarra are many holiday resorts and 'week-end' homes for tired citizens, and a string of watering-places stretches for some 30 miles along the tea-tree-fringed eastern beaches of Port Phillip.

The public institutions of Melbourne include, besides those to whose origin reference has already been made, a national museum and art gallery, housed in the same building as the public library; five well-equipped hospitals, the oldest being the Melbourne Hospital, opened in 1848; half a dozen theatres; three benevolent asylums; literary, historical, scientific, artists' and musical societies; the botanical gardens already referred to, and extensive zoological gardens, situated in the Royal Park north of the city. The principal daily newspapers are the *Argus*, established in 1846, which absorbed older papers dating back to 1838; the *Age*, established in 1854; and the *Herald*, which has had a continuous existence since 1840, and has been published as an evening paper since 1869.

See Bonwick's *Port Phillip Settlement* (London, 1883); Labilliere's *Early History of Victoria* (London, 1878); Rolf Boldrewood's *Old Melbourne Memories* (Melbourne, 1884); Turner's *History of the Colony of Victoria* (London, 1904); Selby's *The Old Pioneer Memorial History of Melbourne* (Melbourne, 1924).

A.W.G.

Meldrum, DAVID MAX, born in Edinburgh in 1875 and brought to Melbourne in 1889, studied art at the national art school, where he won the travelling scholarship (see ART GALLERIES) in 1899. In Europe he devoted much attention to the old masters at the Louvre and exhibited at the Old Salon. Returning to Melbourne in 1913, he took pupils and preached a theory of art which is set forth in *Max Meldrum, his Art and Views* (1919); his influence may almost be said to have founded a 'Meldrum school.' In practice his theories have produced some excellent still-life work and a group of exceptionally fine portraits, especially those of Sir Samuel Griffith (painted for the Commonwealth parliament), Sir Thomas à Beckett (in the Victorian law-courts library), and Archbishop Mannix. His landscapes, while often well painted, are usually too low in tone to suggest the character of Australian country. See ART.

W.M.

Meliaceae, a family of trees or shrubs abundant in the warm or tropical regions of America and Asia, but rare in Africa. Eleven genera with 45 species are indigenous to Australia. The largely tropical genus *Turraea* is represented by one indigenous species, *T. pubescens*, which extends throughout Malaysia. It is a small tree with white, sweet-scented flowers in short spikes or clusters, and an almost globular, furrowed fruit. It has a hard, close-grained timber, dark in the centre, with a bright yellow sapwood. *Amoora* is represented by one indigenous species, *A. nitidula*, a tall tree with a useful, light-coloured, tough wood. *Synoum* has two species endemic in eastern Australia. *S. glandulosum* (Dogwood or Bastard Rosewood), the 'wallaon' of the aborigines, is a small coastal bush-tree, reaching a height of 30 feet, with blush-pink flowers. When ripe the capsules open, and display seeds embedded in a bright red fleshy coat (arillus). The wood, when fresh, is deep red, and emits a rose-like scent. See DYSOXYLON, OWENIA, CEDAR, RED, and CEDAR, WHITE.

'Melville, Captain.' See MCCALLUM, FRANK.

Melville Island. See BUFFALO and NORTHERN TERRITORY.

Menindie Clover. See TRIGONELLA.

Mentha, a genus of the family Labiatae, chiefly extra-tropical, and most abundant in northern Europe and Asia. The species indigenous to Australia are endemic. *M. laxiflora* (Forest Mint) yields a pleasant oil like peppermint oil. That of *M. grandiflora* has a bitter and nauseous taste; that from the stems of *M. gracilis* smells like oil of peppermint with an admixture of pennyroyal. The supply of oil from the leaves is copious. The exotic *M. piperita* is the 'peppermint' of commerce.

Mercury. See MINERALOGY.

Meredith, LOUISA ANNE (1812-1895), daughter of Thomas Twamley, was born at Hampstead near Birmingham on 20 July 1812 and published her first book—*Poems with Illustrations*—in 1833; it, like most of her later works, was illustrated with her own drawings. In 1839 she married her cousin CHARLES MEREDITH (1811-1880), whose father had in 1821 been provisionally granted 2000 acres near Swanport in Tasmania and had a good deal of difficulty in securing the adjustment of his claims; those who care to follow up this matter may study it in *H.R.A.*, series III, vols. iv and v. Charles Meredith, who had for some time been managing a sheep-station in New South Wales for his father, brought his bride to Sydney, and after a visit to Bathurst (of which she left a vivid description) settled her in Wentworth's house at the head of Homebush Bay near Sydney. In October 1840 his father recalled them to Swanport; but the financial crisis of 1843 drove Charles to seek other employment, and from September 1843 to 1848 he was resident magistrate at Port Sorell on the north coast. In 1848 he returned to the Oyster Bay district, and in 1855 was elected by Glamorgan (the Oyster Bay constituency) to the Tasmanian legislative assembly. In the short-lived Gregson ministry of 1857 he was colonial treasurer, as also in the Whyte ministry of 1863-6, minister of lands under F. M. Innes in 1872-3, and treasurer and (for a month) minister of lands in the Reibey ministry of 1876-7. In 1879 he was made police magistrate at Launceston, and died there on 2 March 1880.

Louisa Meredith devoted a great part of her life to describing and illustrating the flora and fauna of Tasmania; her chief publications were *Notes and Sketches of New South Wales* (1844), *My Home in Tasmania* (1852), *Some of My Bush Friends* (1860), *Over the Straits* (1861), *Our Island Home* (1879), and *Tasmanian Friends and Foes* (1880), all illustrated with reproductions of her own drawings or water-colour paintings. In 1890 she returned to England to see through the press a second series of *Bush Friends*, which appeared in 1891. Coming back to Australia in 1892, she settled in Melbourne, and died there on 21 October 1895.

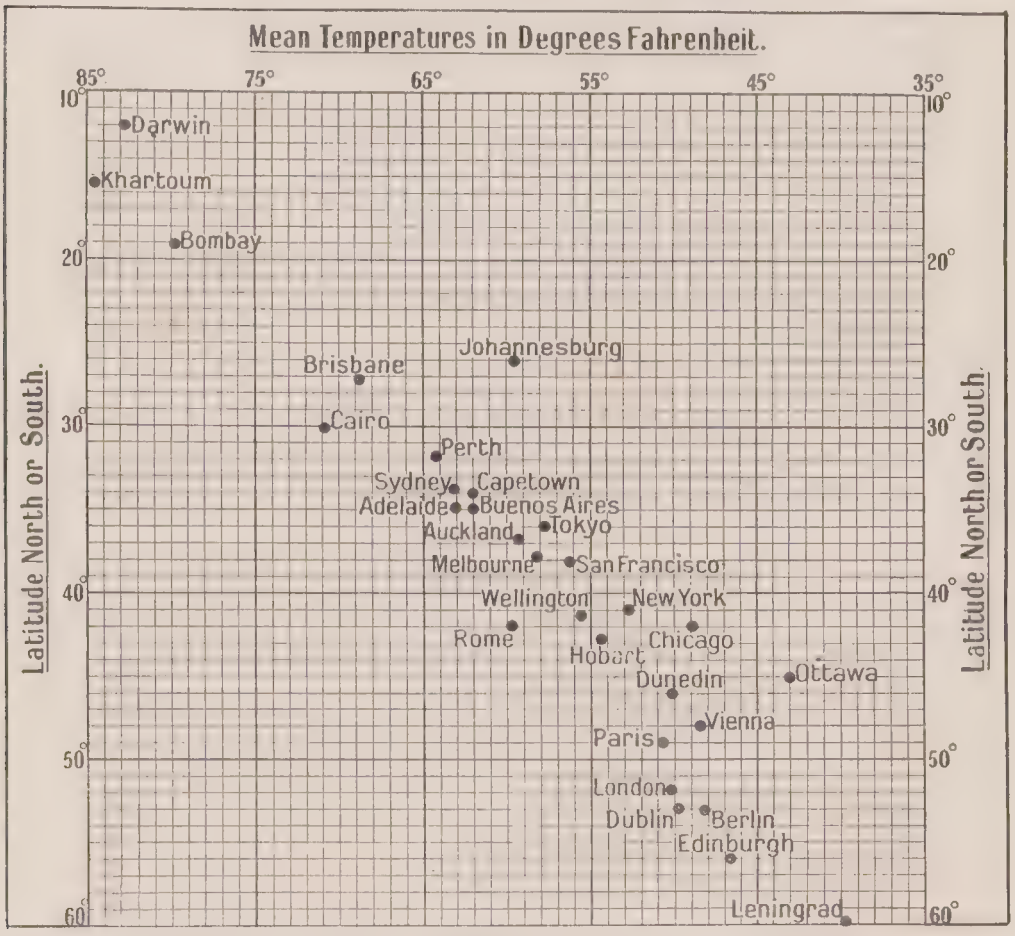
Meteorites. About 70 of these have been found, well distributed over Australia; of those that have been described 40 are siderites, 5 siderolites, and 19 aerolites. The largest, a siderite weighing nearly 3½ tons, was found at Cranbourne in Victoria; it is preserved in the natural history museum in London. Three—those found at Mount Brown, Emmaville, and Binda—were seen to fall. At Emmaville, New South Wales, a house was struck by a 5-oz. aerolite. The interesting pallasite group of siderolites, characterized by much olivine, is represented by no fewer than three falls—at Bendoc in Victoria, Molong in New South Wales, and Mount Dyrring in the same State. Particularly noticeable are four hexahedrites (ataxites) found in a narrowly circumscribed area in New England.

G.W.C.

Meteorology and Climate. The geographical position of Australia, its insularity, and the absence of geographical extremes, make its climate more pacific and equable than those of the other continents. Its northern limit lies 11° from the equator, its southern over 20° from the antarctic circle; these distances, and the influence of the intervening seas, considerably temper the severity of both heat and cold. Of its total area 1,149,320 square miles lie within the tropics and 1,825,261 square miles outside them.

Temperature.—The Australian seasons are:—summer, December to February; autumn, March to May; winter, June to August; spring, September to November. In most parts of the Commonwealth January is the hottest month, but in Tasmania and southern Victoria February is the hottest; in the tropical north, probably because the cooling monsoon rains occur in the late summer, December is the hottest month, and at Darwin November. Throughout Australia the coldest month is usually July. In the hottest months the mean temperatures range from 80° to 85° over all the northern and central regions, from 65° to 70° over the southern. In July only a very narrow strip of the northern sea-coast has a mean as high as 75°, the south ranging from 55° downwards. During the hot months the climate on the coast, except in the south, is invariably enervating. Inland, however, life is generally enjoyable; although the thermometer may in extreme cases rise to 120° in the shade, the dryness of the air and consequent rapid cooling of the skin by evaporation prevents serious discomfort except in the direct rays of the sun. Nocturnal radiation, too, is active inland, and the nights are invariably cool.

During some seasons parts of the continent are subject to prolonged heat-spells. At Marble Bar (a mining township in the north-west of



Mean temperatures of Australian capitals and of certain great cities elsewhere.

Western Australia) the maximum thermometer reached 100° and over, for 103 consecutive days in 1921-22. Nullagine, in the same region, recorded 100° for 57 days in 1900; Boulia, in western Queensland, for 76 in 1914-15; Charlotte Waters, in the neighbourhood of Lake Eyre, for 26 in 1922; and Charleville, in central Queensland, for 20 in 1889. Heat of this description is, however, confined to the interior. Perth has experienced a maximum temperature of 90° and over on 20 consecutive days; Adelaide 14; Melbourne and Brisbane, 8; Sydney, 4; and Hobart, 3.

Shade temperatures give only the actual temperature experienced by dry inorganic substances, not the sensible temperature felt by organic bodies. This difference is due, as already stated, to cooling by the evaporation of moisture from the skin by wind and heat, but more especially by the action of wind. To gauge for practical purposes the temperature of a country, we must take into account also the wet-bulb thermometer. A number of these have been distributed throughout Australia, and, although the period over which observations have extended is in some parts not long enough to determine definite normals, yet sufficient records have been obtained to establish fairly the influence of this climatic element. In no part of Australia is the wet-bulb temperature maintained at a reading sufficiently high to be detrimental to the health and physique of those engaged in outdoor labour. Investigations confine the 80° wet-bulb isotherm to a very narrow tract of country on the north-western coast of Western Australia during the months of December, January, and February; the 70° isotherm extends only to subtropical latitudes over comparatively small areas in Queensland and Western Australia during the same months and March; in southern Australia the readings are from 50° to 70°.

Broome, Port Darwin, and Thursday Island are the hottest centres, having a monthly mean temperature range of 16°, 8.4°, and 4.8° respectively. Thursday Island is undoubtedly the most monotonously warm area in the Commonwealth. Of the capital cities Brisbane is the hottest and Hobart the coldest, the others taking order between them as follows:—Perth, Sydney, Adelaide, Melbourne. The mean temperature range between the hottest and coldest months is between 18° and 23° in all these places.

A comparison of the mean temperatures of the capital cities of Australia with the cities of other countries is shown on the accompanying graph, which shows that Darwin is about 3° warmer than Bombay, but 2° lower than Khartoum: Brisbane is considerably (9.4°) above Johannesburg: Perth is about 7° lower than Cairo: Sydney slightly above Cape Town: Adelaide some 5° above Tokio: Melbourne a little over 2° in excess of San Francisco; and Hobart about midway between Rome and Chicago.

Taking Kalgoorlie and Broken Hill to represent conditions in the interior, we find the extremes much greater. Broken Hill's maximum of 78.3° in January falls to a minimum of 49.6° in July (a range of 28.7°), and Kalgoorlie's 77.3° in January to 51.2° in July (a range of 26.1°).

In subtropical areas insolation is more active over the eastern half than over the western during the early summer months, and more active over parts of the western coastal districts during the late summer months. In eastern Australia, too, the temperatures in the sub-tropics are about 1° higher than in corresponding latitudes in the west. North of the tropic these conditions are reversed, and between latitudes 17° and 20° the difference in excess is as much as 10° in favour of the west coast.

Frost and Snow.—Although observations have been taken continuously for a great number of years, no appreciable frosts have been recorded over all the northern coastal regions extending from Geraldton on the west coast right round the north and east coasts to Brisbane. In all other parts of Australia night frosts are severe and frequent, although of considerably varying periods. On the highlands in New South Wales, Victoria, and Tasmania, frosts of a more or less damaging nature have occurred in every month of the year. Over most of the wheat areas of South Australia, Victoria, New South Wales, and Queensland, they have been recorded between April and October; over north-central and north-eastern Victoria, the south and central western slopes of New South Wales, from April to November; over the Gascoyne and north-eastern parts of Western Australia and central Australia (if we may trust the diaries of explorers) from June to August; in central and western Queensland from June to July, June to August, or May to August; over the southern portion of Western Australia from April to October, or May to September.

Perennial snow is found only over sheltered crevices in the highest portions of the Australian Alps; there, however, during the winter months it accumulates to a depth of many feet, and by gradual thawing maintains a constant flow of water to the Murray and Snowy rivers throughout the year. During the winter period snow can always be expected along the mountain ranges in New South Wales, Victoria, and Tasmania, and occasionally on the

Australia: shaded where snow has fallen.

Mount Lofty ranges in South Australia. On rare occasions it has occurred as far north as Toowoomba in Queensland (latitude 27° 28′ S). Over the plain country it has been known to fall as far west as Louth on the Darling River, and over the whole of eastern and southern Victoria, except the immediate coast-line. In South Australia it has been recorded over a belt of country lying to the east of Spencer Gulf, about 200 miles long, running from north to south and 75 miles wide. West of the Gulf it has been noted at one place only—Yardea near Lake Gardner. In Western Australia it has been recorded on the hills in the extreme south-west, and at a few places on the southern goldfields.

The heaviest snowstorm on record in New South Wales occurred between 3 and 7 July 1900, extending from Congewar in the Hunter district to Condobolin and Warrumbungle, in the west. Railway traffic became paralysed, passengers being shut up in carriages and unable to reach hotels. In places the snow was 8 feet deep on the rails. At Bathurst many roofs, verandahs, etc., collapsed under its weight, and telegraph-lines were levelled everywhere. On 28 July 1901 the most widespread snowstorm occurred over south-eastern Australia, being practically general east of the 145th meridian. Another remarkable storm on 29 and 30 August 1905 extended from South Australia through southern Victoria and along the highlands of New South Wales to within 30 miles of the Queensland border.

On the mainland, Sydney and Melbourne are the only two capital cities that possess authenticated records of appreciable snow-falls. In Sydney on 30 June 1836 snow fell for half an hour, sufficient being on the ground to enable boys to make snowballs. Melbourne was covered with snow 7 to 12 inches deep on the morning of 31 August 1849. Another remarkable fall took place on 7 August 1899 between 1 and 2 p.m., when snow fell heavily in the Fitzroy Gardens, and snowballing was indulged in at the Scotch College nearby. A light to heavy fall also occurred over the north-eastern suburbs of Melbourne between 7 and 8 a.m. on 25 September 1905. Flakes of snow were observed in, or close to, Melbourne on 14 July 1840, 27 June 1845, 26 July 1882, 28 June 1900, 18 April 1910, and 21 June 1911.

Evaporation.—This is a climatic element second in importance to rainfall alone. To obtain data concerning its rate and distribution iron-jacketed tanks 3 feet in diameter, containing 130 gallons each, have been sunk at selected centres so that their tops are within an inch of the surface-level of the ground. In order that the exposed level may be fairly constant, and that the added water may not materially affect the temperature of the main body, the contents of each tank are replenished when or before a fall of 6 inches has taken place through evaporation. The information so far obtained is not very extensive, and observations have been made in some centres for a few years only; but a rough approximation to the times of equal evaporation and the aggregate annual amounts can be satisfactorily made. On the coast observations have been made for many years at the capital cities of the States, and at Rockhampton, Cooktown, Thursday Island, and Darwin. Inland there are stations at Marble Bar and Kalgoorlie in Western Australia, Alice Springs in the Northern Territory, Boulia in Queensland, and Broken Hill and Burrinjuck in New South Wales. At Broken Hill observations are made both with a tank at Umberumberka and on the evaporation from the Stephen's Creek reservoir a few miles away.

Evaporation Map showing amount of evaporation and Isatmics.

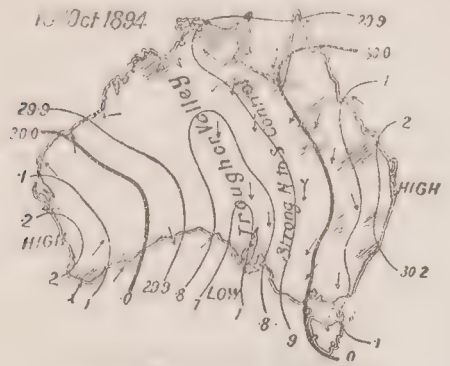
About a third of the continent—almost the same area which has an average annual rainfall of 10 inches and under—loses by evaporation from exposed water 100 inches and over per annum. During the summer months the daily rate all over Australia is considerable; inland from ½-inch to ¾-inch is often lost in a day, and losses of an inch and over have been registered. It follows (*a*) that shallow tanks and dams are practically useless, since the loss of half an inch over their wide area involves a great quantity of water, whereas that loss from the surface of a deep tank would be comparatively small; (*b*) that, if it is desired to receive any benefit from showers, every possible means of breaking up the surface-soil, even on grazing-land, must be adopted in order to let the rain through below the influence of surface-evaporation.

Rainfall.—The two main sources of Australian rainfall are the southern low-pressure systems (depressions) which skirt the southern shores of the continent mainly during the winter months, and the tropical low-pressure systems which operate chiefly in the summer months. A secondary but important source of supply is the anticyclone, which by inducing a flow of moist air from the adjacent ocean waters at any time during the year may bring about copious rains over the eastern littoral. Minor sources of rain are hurricanes (often incorrectly called 'cyclones') and tornadoes; but although these storms are characteristic of the country and result in heavy downpours, they cannot be regarded as staple or widespread givers of rain.

One of the most important rain-producing processes, at all events to Australian meteorology, is the movement of air from warm to cool latitudes and zones, causing condensation and finally bounteous precipitation over vast areas, with more or less disregard of the influence of land elevation or of barometric fluctuations. The characteristic isobaric conditions which precede or accompany this form of rain production are anticyclones of great dimensions and of considerable intensity, covering the eastern half of Australia, and perhaps an equal area of the ocean to the east. Their western isobars are comparatively straight, extending from Port Darwin to the southern ocean east of Spencer Gulf. The areas of low pressure that follow generally take the form of a shallow trough or valley, extending through the centre of Australia from the northern to the southern seaboards. A direct and rapid wind-circulation control extends from the equatorial zone to temperate latitudes, resulting in conditions particularly favourable for widespread and heavy downpours. The rainy season in Western Australia may be said to result almost solely from this physical action. The rain-bearing winds are northerly, precipitation becoming heavier as higher latitudes are reached. Rain visitations of this character are not infrequent; consequently, although rain-seasons may be irregular, relief from dry spells may occur long after the normal period for rain has passed. This peculiarity is a happy feature of

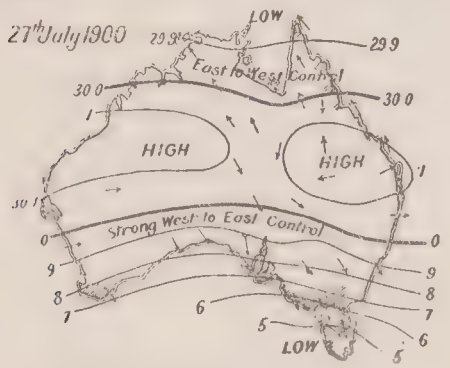
Australian climate, and very different from the conditions that obtain in India—where, if the monsoon season fails to bring rain, very little hope of relief can be looked for.

Any isobaric distribution that controls a strong wind-circulation from warm to cool areas, more especially from warm to cool latitudes, will bring about good rains, and the recurrence of such isobaric distributions is typical of good seasons. On the other hand, extensive isobaric distributions that control a wind-circulation



Isobaric distribution (wet type).

from cool to warm zones or latitudes, or that control a wind-circulation along parallels of latitude, will bring little or no rain except in



Isobaric distribution (dry type).

opposing coastal areas; these distributions predominate during, and are typical of, a dry season.

The normal distribution of rain in Australia has been ascertained from observations made over a minimum of 20 and a maximum of 50 years. During the hotter months (November to April inclusive) the northern parts of Australia are wet and the southern dry; during the colder months (May to October inclusive) the southern parts are wet and the northern dry. The rainfall is distributed fairly generally throughout the year over the eastern areas of Australia. During January and February fully three-fourths of the continent, comprising the whole of the northern and eastern areas, are wet; the central, southern, and south-western portions are distinctly dry. In March there is a general retreat northward of the rainfall area to the extent of 200 miles in Western Australia, a slight extension westward in the south-eastern quarter of the continent, and in Western Australia the 1-in. isohyetal appears on the extreme south-western coast. In April the northern rain area retreats in central Australia from the tropic to within 300 miles of the north coast, though still lagging over the north-western coast of Western Australia and the Murchison goldfields. In the south a decided westerly extension takes place from the south-eastern States to South Australia and Western Australia, the 1-in. isohyetal sweeping continuously round the southern shores with the exception of a short break at the head of the Great Bight. The northern rain entirely disappears in May, and the southern extends up the western coast of Western Australia to within a few miles of Cossack; quantities increase, as compared with those of the previous month, by 4 inches in the extreme south-western corner. June, the wettest month of the year for southern Australia, shows a complete reversal of January rain conditions. In Western Australia precipitation is general during this month west of a line joining Derby and Eyre, and in South Australia the 1-in. isohyet reaches its farthest northern limit in close proximity to Farina.

From July to December the rain area as a whole swings back in the opposite direction to its march during the first six months. On the western coast the 1-in. line steps back to Onslow in July; to Hamelin Pool in August; to Geraldton in September; still farther south in October; and all but disappears in the extreme south-west in November, so that little or nothing is left in December. While this retreat is taking place in the west, a corresponding advance is going on in the east. Between the end of June and the end of August there is little change, but from September to the end of the year the expansion of area and quantity of rain increase rapidly. October brings the return of monsoon rains in the Northern Territory; in November they have penetrated 450 miles farther into the interior and connected up with the permanent rain area over eastern Australia. In December monsoon rains cover practically the whole continent north of the tropic and east of the 144th meridian.

All this implies an oscillatory movement of the seasonal rains of Australia about a centre in the vicinity of Forbes in New South Wales.

Roughly speaking, June is the wettest month over that portion of Australia lying to the south of a line joining Onslow on the north-western coast of Western Australia and Sydney on the eastern coast. To the north of that line, January is the wettest month, although February runs it very closely over a wide belt of country extending from the lower Northern Territory through south-western Queensland to northern parts of New South Wales. March is the wettest month in parts of central Queensland, parts of central New South Wales, and over a comparatively small area on the north-western coast of Western Australia. At the junction of the summer and winter rains the wettest month is somewhat indeterminate. In New South Wales, for instance, every month with the exception of September is the wettest in some part or other—with a preponderance for June in the southern half, and January, February, and March in the northern half.

In *Western Australia* the heaviest rainfall occurs over the south-western portion of the State, which has a long coast-line exposed to the Indian Ocean and the full force of the westerly winds of southern latitudes. The rainfall there, and in fact over the south-western

half of the State except the eastern goldfields, is a winter one, 80 to 90 per cent of the annual totals, in the south-western agricultural areas, falling during the growing-period (April to October). From the coast for about 80 to 100 miles inland the rainfall decreases rather rapidly, but the area in the south-west over which 15 or more inches fall amounts to 80,135 square miles. The rapid increase from the western coast inland is partly accounted for by the range of hills which runs parallel to the coast from the extreme south to beyond the Murchison River, although they are not of sufficient elevation to serve as a natural store for precipitation in the form of snow. At some places on the southern area of these hills the annual rainfall exceeds 42 inches—about 10 more than on the coast. Inland, owing to the vast extent of land between the goldfields and the South Australian boundary over which the easterly winds pass, the evaporation is very great, amounting to about 87 inches annually at Coolgardie. On the coast, at Perth, it is 66 inches.

The full effects of the westerly winds of southern latitudes are apparently not felt beyond lat. 27½°, just reached by the 15-inch isohyet, and from there to the tropic the rainfall is scanty and occasionally amounts to only 3 or 4 inches in the year. From that isohyetal inland, towards the Murchison and North Coolgardie goldfields, though the records only extend back some 15 to 20 years, it is not likely that longer records will show much difference in the annual rainfall. The 10-in. isohyet skirts Yalgoo and Kalgoorlie and farther inland the average rainfall is below 10 inches, but those districts are subject at times to abnormal falls, as e.g. in March and April 1900, and January and February 1902, when Peak Hill registered 18.13 and 14.56 respectively, and Wiluna 22.82 and 9.69 inches.

North of the tropic, the Kimberley district receives good tropical rains during the summer months (November to March or April), but the De Grey and Fortescue districts are dependent for their rainfall partly on the tropical storms commencing about December, and partly on the winter rains from the Indian Ocean. The total amounts are smaller than those in the Kimberley district, and very variable; sometimes both tropical and southern winter rains fail, and at other times phenomenal falls occur during the 'willy willy' (or hurricane) season. Whim Creek registered 36.53 inches on three days in April in 1898.

The areas in Western Australia receiving varying quantities of rainfall, as shown on the map, are as follows:—

Rainfall.	Area in Square Miles.		
	Tropical, North of Tropic.	Remainder of Western Australia, South of Tropic.	Whole State.
Under 10 inches ...	52,368	434,584	486,952
From 10 to 15 inches ...	146,770	108,322	255,092
,, 15 ,, 20 ,, ...	62,851	31,250	94,101
,, 20 ,, 25 ,, ...	30,372	13,968	44,340
,, 25 ,, 30 ,, ...	23,876	8,114	31,990
,, 30 ,, 40 ,, ...	36,642	22,878	59,520
,, 40 ,, 50 ,, ...	...	3,663	3,663
Over 50 inches ...	...	262	262
Total	352,879	623,041	975,920

The main factors which determine the rainfall distribution of *South Australia* are the proximity of the Southern Ocean and the long extent of coast-line exposed to the free and unrestricted sweep of the westerly winds nautically known as 'the roaring forties.' The rainfall over all coastal areas is essentially a winter one, and practically all available for agricultural purposes, as from 70 to 90 per cent of the total in the more settled areas falls during the growing-period (April to October). Though physiographic influence is less apparent than in south-eastern Australia, the effect of elevation is marked by the heavier rainfalls on the eastern sides of Spencer Gulf and the Gulf of St. Vincent, and by the northerly extension of the 10-inch isohyetal line from Port Augusta to beyond Beltana. The abundant rains on the Mount Lofty ranges, east of Adelaide, are a conspicuous example of this, the annual total on the crest of the range approximating to 50 inches. A rapid decrease takes place from the agricultural areas northwards to the interior, where in the Lake Eyre basin (which is below sea-level) the average annual fall—largely made up of capricious summer storms—is under 5 inches. This district is probably the driest part of the continent. In the Northern Territory the chief factor in the distribution of the rainfall, which is almost entirely confined to the six summer months, is latitude or distance from the north coast—the rains being abundant on the coast, but rapidly decreasing towards the interior.

The areas in South Australia and the Territory enjoying varying quantities of rainfall are as follows:—

Rainfall.	Area in Square Miles.	
	South Australia.	Northern Territory.
Under 10 inches	310,660	140,500
From 10 to 15 inches	36,460	132,780
,, 15 ,, 20 ,, ...	19,940	63,026
,, 20 ,, 25 ,, ...	8,620	49,157
,, 25 ,, 30 ,, ...	3,253	41,608
,, 30 ,, 40 ,, ...	1,036	37,642
,, 40 ,, 50 ,, ...	96	31,425
,, 50 ,, 60 ,, ...	.....	25,456
Over 60 inches	.....	2,026
Total	380,070	523,620

The eastern littoral of *Queensland* from Cape York to the Tweed receives an annual average rainfall of about 60 inches. On parts of the north coast, between Cooktown and Townsville, this increases to 150 and 165 inches per annum. The main source of supply is the south-east trade wind, and local variations in totals are solely due to differences in elevations of the shore-line. On the peninsula the rainfall ranges from 68 inches at Cape York to 33 inches at Walsh River; in lower Carpentaria it averages from 16 to 39 inches. In the central districts the average varies from 30 inches on the eastern boundary to 17 inches on the western. In the Maranoa it averages about 23 inches, and over the Darling Downs from 25 to 30 inches. In the Warrego it varies from 15 to 20 inches, and in the far western districts from 15 inches down to 7 inches at Birdsville, in the extreme south-west corner. See MANDATED TERRITORY.

During the wettest months of the year (January to March) very heavy daily falls over the

eastern areas are not by any means infrequent. A fall of 10 inches and over in the 24 hours have been recorded on many occasions. On 2 February 1893 35.71 inches were measured at Crohamhurst on the Blackall Range; this constitutes one of the world's records for heavy rainfall. On that occasion the total measurement for the four days ending 3 February was 77.305 inches. The following table shows the areas in square miles of varying quantities of rainfall:—

Rainfall.	Area in Square Miles.
Under 10 inches	80,496
From 10 to 15 inches	81,549
,, 15 ,, 20 ,, ...	111,833
,, 20 ,, 25 ,, ...	143,610
,, 25 ,, 30 ,, ...	99,895
,, 30 ,, 40 ,, ...	61,963
,, 40 ,, 50 ,, ...	51,956
,, 50 ,, 60 ,, ...	25,286
,, 60 ,, 70 ,, ...	9,506
Over 70 inches	4,406
Total	670,500

In *New South Wales* nearly all the districts near the coastal rivers show a depressed rainfall in comparison with surrounding and naturally higher country. Starting from the northern border, the 50-in. isohyetal line at Casino on the Richmond River deviates slightly towards the sea-line; the same feature may be noted, in a more or less marked degree, on the Clarence, Macleay, Manning, Hunter, and Shoalhaven rivers. The Nepean valley can be traced right through from Picton to the Hawkesbury by its relatively light rainfall. On the northern tablelands the higher levels enjoy falls well over 30 inches. The extension of that isohyet encloses a narrow tongue-shaped area, reaching in a south-westerly direction from Inverell to Lindsay; the elevation of this area is higher than that of the country on its western and southern boundaries.

Farther south the effect of the Blue Mountains and the Canobolas is particularly conspicuous. The extension of the Australian Alps, which almost entirely feed the Murrumbidgee River and contribute largely to the constant flow of the Murray, stands out in clear relief. Although a considerable distance from the coast, the elevation is such as to modify the disadvantage resulting therefrom; and not only is abundant moisture extracted from the winds from the east coast, but considerable condensation takes place on the western aspect from south-western winter winds that have swept across nearly the whole of Victoria. The comparatively light rainfall in the district extending from Delegate to Yass (especially between Bobundra and Michelago) is one of the most remarkable features of the rainfall map. Although the greater part of this district is considerably over 2000 feet high, it is enclosed by ranges rising to 3000 and 5000 feet, which intercept moisture that would otherwise benefit it. Yet, although the falls over this area do not exceed 25 inches, it is remarkably productive; evaporation is relatively small, and a vast quantity of soakage must find its way there from the encompassing ranges. The Sydney and Burrinjuck water-supply catchment-areas receive annual totals ranging from 30 to 60, and from 20 to 60 inches respectively.

Areas in New South Wales enjoying varying quantities of rainfall are shown in the following table:—

Rainfall.	Area in Square Miles.
Under 10 inches	48,749
From 10 to 15 inches	78,454
,, 15 ,, 20 ,, ...	55,762
,, 20 ,, 25 ,, ...	45,140
,, 25 ,, 30 ,, ...	30,539
,, 30 ,, 40 ,, ...	33,557
,, 40 ,, 50 ,, ...	11,517
,, 50 ,, 60 ,, ...	4,620
,, 60 ,, 70 ,, ...	1,669
Over 70 inches	365
Total	310,372

In *Victoria* the abundant rains on the Australian Alps, the Cape Otway ranges, and the Gippsland ranges are particularly conspicuous. In a less striking manner is shown the precipitating effect of the central Dividing Range and the Grampians. The comparative lack of rainfall in the relatively depressed areas north and west of Melbourne is due to the effect of the higher surrounding country on rain-bearing winds. A similar effect is noticeable in the Latrobe, Thomson, Tambo, and Mitta Mitta valleys.

Areas in Victoria enjoying varying quantities of rainfall per annum are as follows:—

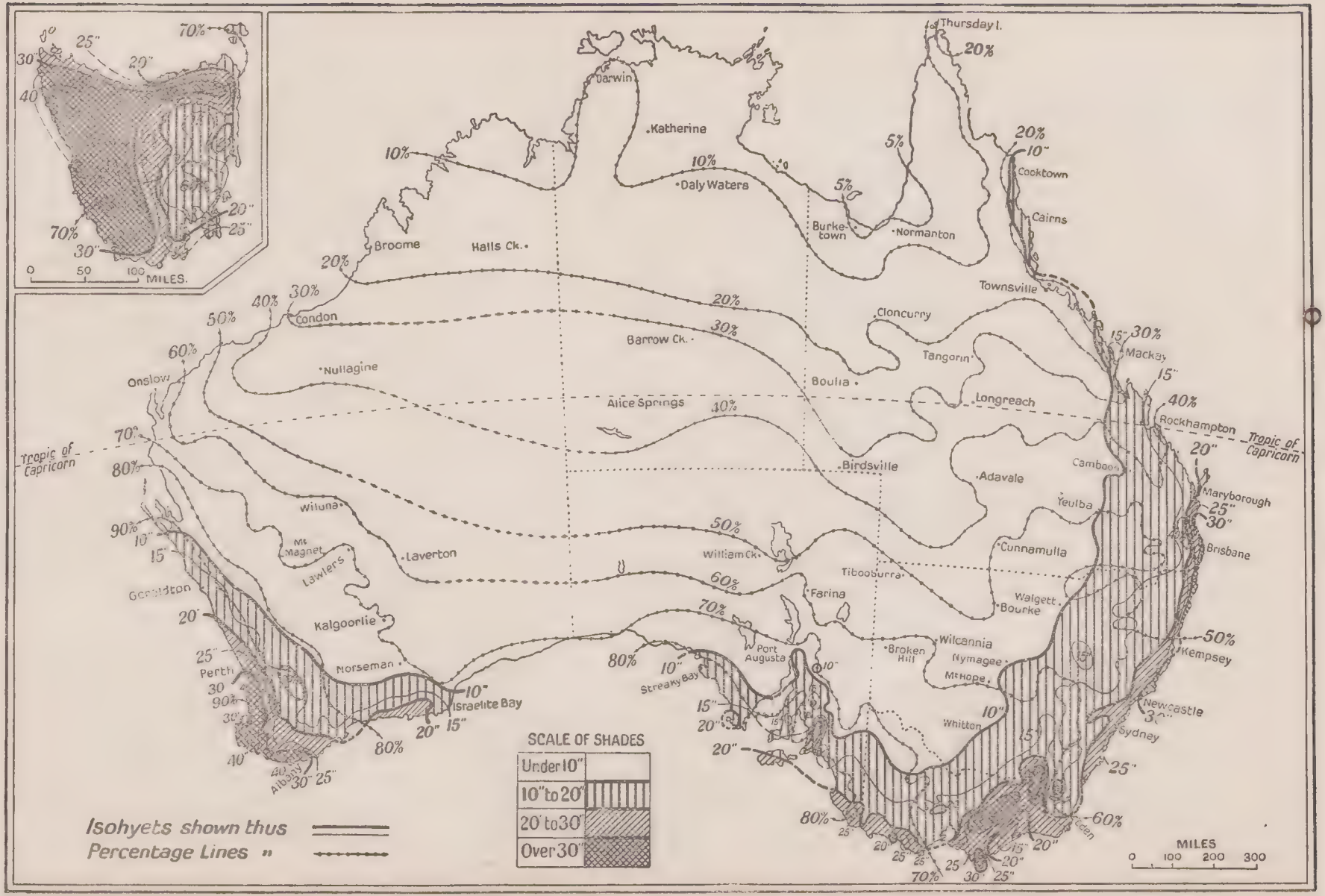
Rainfall.	Area in Square Miles.
From 10 to 15 inches	19,270
,, 15 ,, 20 ,, ...	13,492
,, 20 ,, 25 ,, ...	14,170
,, 25 ,, 30 ,, ...	15,579
,, 30 ,, 40 ,, ...	14,450
,, 40 ,, 50 ,, ...	7,338
,, 50 ,, 60 ,, ...	2,980
Over 60 inches	605
Total	87,884

In the western coastal district and the north-east of *Tasmania* the rainfall varies so much that, until records are available for a long series of years, the isohyets are bound to be considerably altered at the end of each year.

The extremes and means are shown in the following table:—

Rainfall.	Highest.	Lowest.	Mean.
	Inches.	Inches.	Inches.
North-east district, Springfield	86·84	36·81	56·61
Western district—			
Waratah	117·24	59·97	86·50
Mount Read	145·04	70·38	110·45

The most striking feature in these parts of the island is the great variation shown for such a comparatively small area between the greatest and least average falls—from 17.93 inches at Beaufront near Ross to 116.92 at Mount Lyell on the west coast, showing a range of 98.99 inches. The west coast, being exposed to the full sweep of moisture-laden westerly winds—condensation being assisted by altitudes of between 3000 and 5000 feet—experiences frequent rains, and high annual averages, over 100 inches in places, are the result. The effect of altitude is again noticeable in the south-east, where Hobart, at an elevation of 160 feet, has an annual rainfall of 23.83 inches, while the



AVERAGE RAINFALL FOR THE WHEAT-GROWING PERIOD (APRIL TO OCTOBER).

adjacent Mount Wellington, at the 2500-ft. level, totals 59 inches.

The heavy rains experienced in the north-east are similar in character to those on the coast of New South Wales and eastern Victoria, and the south-east winds exercise a certain amount of control over the rainfall of this portion of the island.

Areas in Tasmania enjoying varying quantities of rainfall are as follows:—

Rainfall.	Area in Square Miles.
From 15 to 20 inches	304
„ 20 „ 25 „	3,844
„ 25 „ 30 „	3,016
„ 30 „ 40 „	5,027
„ 40 „ 50 „	3,107
„ 50 „ 60 „	2,344
„ 60 „ 80 „	3,144
„ 80 „ 100 „	2,136
Over 100 inches	516
No records available	2,777
Total	26,215

Bruni Island has been included with the mainland.

Rainfall and Wheat-growing.—In Australia wheat-growing under ordinary conditions is generally considered payable when at least 10 inches of rain fall in and between April and October. There are approximately 484,330 square miles of country satisfying this condition, distributed as follows.—93,500 square miles in Western Australia, 46,980 in South Australia, 79,247 in Queensland, 163,772 in New South Wales, 74,616 in Victoria, and 26,215 in Tasmania. Much of the land, however (probably half the total), is unfit for wheat-growing by reason of excessive rains, early summer rain, topography, or soil; but as compensation large tracts of interior land may be brought under cultivation by the adoption of drought-resisting seed and dry-farming methods.

The boundary of the 10-in. wheat period isohyet starts on the western coast of Western Australia, a few miles south of Hamelin Pool, thence passes inland in a south-easterly direction towards Southern Cross, from there almost due east, entering the Great Bight to the north of Israelite Bay. It again enters the mainland between Fowler's Bay and Streaky Bay, in South Australia, curving south-eastwards from Yardea to Spencer Gulf to the north of Cowell, and crossing the gulf it strikes the peninsula near Port Pirie, forming a loop over the country well to the north of Port Augusta, whence it takes a sinuous course southwards through the lower Mallee to the north-east Wimmera, crossing the Murray River in a north-easterly direction to the west of Deniliquin in Riverina, then over the Murrumbidgee River at Darlington Point, from there bending northwards and passing successively near Mount Hope, Nymagee, Coonamble, Walgett, to Mungindi, whence it extends almost in a direct line northwards, finally leaving the Queensland coast at Bowen.

Barometric Pressure.—South of a line joining Perth and Brisbane the annual average pressure is 30 inches. To the north of that line it gradually diminishes to 29.8 near Cambridge Gulf, on the extreme north-western coast, and on the coast of the Northern Territory.

In January the average pressure over southern Australia varies from 29.8 to 29.95 and in northern Australia from 29.7 to 29.8 inches. In July south from the tropic the average is from 30.1 to 30.15, and north of it from 30.1 to 29.9. Over the northern half of the continent only one monthly maximum and minimum of pressure is noticeable—in July and January respectively—but over the southern half there are two minima which become increasingly marked as the south-east corner of the continent is approached. These minima occur in May and July. Throughout the year there is generally shown a concentration of pressure over the south-eastern quarter of the continent and the reverse in the north-western quarter.

TABLE OF MEAN MONTHLY AND ANNUAL BAROMETRIC READINGS.

Reduced to 32° F., mean sea-level, and standard gravity at capitals and some principal towns in the Commonwealth.

	Height above Sea-level.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
	Feet.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Darwin ...	99	29·707	29·718	29·751	29·802	29·853	29·882	29·899	29·897	29·868	29·833	29·785	29·728	29·810
Broome	34	29·724	29·740	29·774	29·860	29·923	29·956	29·974	29·964	29·917	29·867	29·802	29·748	29·854
Perth ...	197	29·908	29·924	29·987	30·075	30·073	30·058	30·092	30·086	30·060	30·030	29·988	29·927	30·017
Kalgoorlie	1,261	29·861	29·892	29·966	30·076	30·092	30·079	30·110	30·092	30·022	29·964	29·912	29·852	29·993
Alice Springs	1,926	29·712	29·738	29·846	29·981	30·063	30·093	30·117	30·060	29·972	29·888	29·808	29·738	29·918
Adelaide	140	29·915	29·953	30·038	30·121	30·121	30·092	30·127	30·099	30·038	29·999	29·975	29·918	30·033
Broken Hill	1,001	29·848	29·885	29·977	30·104	30·124	30·110	30·136	30·124	30·038	30·002	29·924	29·842	30·009
Bendigo	825	29·880	29·936	30·002	30·114	30·114	30·084	30·096	30·093	30·019	29·986	29·927	29·860	30·009
Ballarat	1,430	29·896	29·940	29·989	30·081	30·088	30·062	30·058	30·060	30·002	29·978	29·926	29·860	29·995
Geelong	90	29·966	30·016	30·038	30·128	30·118	30·077	30·084	30·079	30·024	30·014	29·979	29·918	30·037
Melbourne	115	29·910	29·960	30·033	30·105	30·102	30·071	30·094	30·065	29·996	29·965	29·948	29·897	30·012
Hobart ...	177	29·830	29·928	29·936	29·966	29·981	29·938	29·930	29·927	29·846	29·839	29·799	29·806	29·894
Launceston	33	29·866	29·954	29·952	30·012	30·000	29·964	29·956	29·955	29·880	29·863	29·836	29·798	29·920
Canberra	1,837	29·860	29·916	29·980	30·099	30·132	30·083	30·141	30·101	30·035	29·978	29·904	29·861	30·008
Bulli	33	29·906	29·975	30·014	30·077	30·098	30·060	30·069	30·074	30·005	29·986	29·937	29·878	30·007
Sydney ...	146	29·899	29·946	30·011	30·076	30·079	30·055	30·073	30·070	30·006	29·971	29·938	29·881	30·000
Newcastle	112	29·888	29·946	29·992	30·070	30·078	30·055	30·064	30·070	30·008	29·976	29·931	29·866	29·995
Brisbane	137	29·868	29·901	29·958	30·050	30·086	30·064	30·072	30·096	30·036	30·003	29·955	29·888	29·998
Rockhampton	37	29·806	29·838	29·880	29·988	30·044	30·054	30·067	30·086	30·036	29·989	29·924	29·836	29·962
Thursday Is.	17	29·732	29·750	29·760	29·793	29·829	29·849	29·867	29·888	29·868	29·846	29·794	29·753	29·811

Winds.—The most conspicuous winds of Australia are (*a*) the south-east trades, which blow almost continuously over the northern half of the continent, and (*b*) the westerly winds ('roaring forties') which during the winter months extend northwards over the whole of the southern areas. Both these winds, however, are strongly deflected by continental or monsoonal

influences—so much so that in summing up the average prevailing direction of wind in different parts of Australia, particularly over the southern portions, these two great systems of wind circulation are almost obscured.

On the southern coastal areas, for example, the average prevailing direction has a strong southerly component during the summer months, and a northerly component during the winter months; in the north of the continent a strong northerly component during the summer months and a southerly during winter months. On the New South Wales coast the mean direction in summer is from the north-east, and in winter from the west. On the Western Australian coast the mean direction during the summer months is from south-west to south-east, and during the winter from north-north-west to north-north-east. Inland the mean direction of wind is largely dominated by the seasonal distribution of pressure. Thus during the winter months, when anticyclones are constantly building up pressure in the interior, there is a decided spiral, contra-clockwise circulation from the centre towards the coast-line. During the summer time, owing to strong convectional action in the interior and consequently lowered pressure, the circulation is reversed, and a clockwise, spiral circulation obtains from the ocean to the centre of the continent. Additional minor factors of wind-control are occasional unusually energetic cyclones (chiefly on the eastern and north-western coast-lines), and tornadoes—which may occur in any part of Australia during the summer months, but are most frequent over inland areas. These tornadoes generally develop in extensive barometric col areas, or over zones where the pressure is uniform and without isobaric control, or in the north-eastern or northern gradients of cyclonic depressions moving across the southern interior of the continent—the gradients again being very slight. They generally travel on a north-north-west to south-south-east course, and at times are so strong as to level strips of country forest and destroy townships.

A north-east sea-breeze ('black north-easter') is a notable feature of Sydney weather. It starts to blow about 10 a.m. on bright summer mornings, gradually increasing in force until 3 p.m., when it often reaches a velocity of 30 or 40 miles per hour; from that hour it gradually moderates, and generally ceases with sundown. The depth of this wind is comparatively slight; it does not ordinarily penetrate inland more than 10-20 miles.

'Southerly busters' are a distinctive feature of summer weather on the coast of New South Wales, occurring most frequently between September and February inclusive, and between 7 p.m. and midnight. The wind comes suddenly from the southerly quarter, causing a fall in temperature of from 20 to 40 degrees in 24 hours; the most rapid decline takes place during the first hour of the blow. The mean velocity is about 32 miles per hour, and many gusts may reach a rate of 80 miles and over. Blows may last for a few hours only or for several days, the duration being dependent upon the extent of the anticyclone to the west. Thunderstorms frequently accompany the bursts, but useful rains occur only when the centres of the high pressure are travelling in high latitudes. The rate of translation of a 'buster' along the coast is about 20 miles per hour, and has no relation to the velocity of the prevailing wind. A mild burst may be translated at 60 miles per hour from point to point on the coast, whereas a violent burst may be translated at less than 20 miles per hour. 'Busters,' while undoubtedly deflected sea-breezes, occur generally with the passage of the axis of V-shaped depressions backed up by anticyclones to the west of them. The change of wind takes place from a northerly to a southerly component at the moment when the axis happens to coincide with or cross any point; but, as the axes of these depressions are constantly varying in their angular relation to the coast-line, it follows that the rate of translation must vary accordingly. If the axis takes the same angle as the coast-line, the burst occurs almost simultaneously on all parts of the coast. If the axis is vertical or runs from north-west to south-east, translation is from south to north; this is the general experience, but it has happened that the bursts have worked down the coast, owing to the axis of the depression on such rare occasions running from south-west to north-east.

Southerly winds of this kind are most frequent during seasons of sporadic rains in the interior, and least frequent during exceptionally rainy seasons in the interior—which is strong evidence that they are a response to intense heat-convectional action inland. They can always be looked for on hot days; but the most reliable attending indication is the proximity of a V depression, or relatively low barometers in comparison with those over Victoria. A foggy morning following a hot day is also a sure sign, and the local barometer invariably starts to rise slowly several hours before their advent. They now rarely arrive without ample warning. The average number of visitations in a season is 32; the greatest number (58) was recorded in 1896, and the least (16) in 1890, when vast areas in western New South Wales were under the flood-waters of the Darling River.

The term 'brickfielder,' now applied to hot, dusty northerly winds on the goldfields of Victoria, was the first name given to the 'southerly busters' in Sydney. Brickfields in the early days were worked to the south of the infant city, and with the arrival of southerlies clouds of dust from these fields were brought to the northern end of the town. Diggers from Sydney, migrating to the goldfields of Victoria half a century ago, transferred the name to the hot northerlies prevailing there.

The 'Fremantle doctor' is the local sea-breeze at the chief Western Australian port. It is a cool wind from the south-west, generally starting soon after midday during the summer months, and, of course, moderating with the declining sun.

'Cock-eye Bob' is the name given to thunder-squalls which occur frequently on the north-west coast of Western Australia during the summer months.

Hurricanes.—The two zones of Australia subject to hurricanes are the north-western coast of Western Australia and the northern coast of Queensland. The hurricanes on the former, known as 'willy willies,' are, perhaps, the more violent of the two. The storms occur between the months of November and April (inclusive), but more frequently during January and March. They appear to originate in the vicinity of Cambridge Gulf, or even as far east as Darwin. They then start on a parabolic course along the north-western coast-line, gradually intensifying until they reach the latitudes of Condon and Cossack, where they generally reach their greatest energy and cause considerable damage to the pearling-fleets as well as to property on shore.

From this position on the north-west coast they usually recurve inland, gradually expanding in dimensions, and, travelling through the Murchison and Coolgardie goldfields (where they precipitate at times torrential rains) finally pass into the Great Bight, thence following the course of the southern depressions. Whim Creek on the north-western coast has frequently received 10 inches of rain from these hurricanes. On 3 April 1898 29.41 inches were registered for the 24 hours, together with a fall of 7.08 on the previous day—a total of 36.49 inches within 48 hours.

The isobaric indications are a high-pressure system over subtropical areas, and an incipient low on the north-western coast. When local barometers show signs of falling with an easterly wind, conditions are conducive to the development or approach of 'willy willies,' and precautions should be taken accordingly. A rapid fall with increasing force of wind from the east may be regarded as a definite indication of a heavy blow. Divers affirm that 24 hours' notice is always given of the approach of these storms by a sub-oceanic swell, and mariners say that the sky assumes a pale-green aspect for a day or so before the hurricane arrives.

Hurricanes on the north-eastern coast occur most frequently between January and April, but occasionally may appear as late as June. They

WET SEASONS AND STORM SEASONS

begin generally in the South Seas in latitude 8° or 10° S., follow a parabolic course similar to that of the western hurricanes, and almost invariably strike the coast between 15° and 20° S. latitude, in which zone they exhibit their most violent phases. Occasionally, however, they first present themselves nearly as far south as Brisbane, travelling thence down the eastern coast as far as Sydney, finally passing off into the Tasman Sea. The rain from these hurricanes is in all cases very heavy on the coastal and highland areas over which their influence extends.

One of these hurricanes struck Port Douglas on 16 March 1911, killed two men, and practically destroyed the township, together with all the meteorological equipment, so that no local rain was recorded. At South Mossman, 8 miles distant, the total rain registered in 24 hours was 16.1 inches. During the passage of another cyclonic storm towards the end of the month, over 63 inches fell at the same place in five days, distributed as follows:—3.44 on the 30th; 9 on the 31st; 31.53 on 1 April; 13.74 on the 2nd; and 5.64 on the 3rd. During the fall of the 31.53 inches the following measurements were recorded:—8.28 inches in 7½ hours, 9.7 in 3 hours, 3.93 in 2 hours, and 9.62 in 11½ hours.

The 1918 hurricane-season—in which two storms struck and crossed the coast-line, causing an enormous amount of damage—was perhaps the most severe ever experienced in Queensland.

On 20-21 January a tropical storm crossed the coast in the vicinity of Mackay with disastrous results. Twenty lives were lost; many of the

buildings in Mackay were damaged or completely demolished; the bridge across the Pioneer River (connecting North and South Mackay) was wrecked, and several small steamers, lighters, and motor-boats were either wrecked or left stranded on shore. The cyclone was accompanied by a 'storm wave' of about four feet, which swept up the river on top of a high tide, and caused considerable damage by flooding. Barometric pressure fell to 27.55 inches. The heavy rain which almost always accompanies these storms was not experienced until immediately in front of the centre and during the passage of the rear half. No observations were taken at Mackay at 9 a.m. on the 21st, but between 9 p.m. on the 20th and 9 a.m. on the 22nd 2270 points were recorded. This was followed by 1725 points to 9 a.m. on the 23rd, 1361 to 9 a.m. on the 24th, and 68 points to 9 a.m. on the 25th, making a total of 5642 points (over 5½ feet) in 4½ days.

On the night of 10 March a tropical storm struck and crossed the coast-line in the neighbourhood of Flying Fish Point, and, travelling inland, wrecked or damaged almost every building in Innisfail. Other centres that suffered severely were Babinda, Cairns, and Herberton. From the seaboard to the Atherton tableland the tropical vegetation was torn and stripped almost bare of leaves and branches. Sixteen lives were lost. Barometric pressure fell to 27.88 inches. This storm was perhaps more severe than the Mackay cyclone, though the latter was of longer duration and accompanied by heavier rain. At Dunk Island, which lies in the Pacific 110 miles north of Townsville, about 60 miles south of Cairns, and 2½ miles off the Queensland coast, the cyclone of 10 March was severely felt, as the following extracts from E. J. Banfield's *Last Leaves from Dunk Island* (Sydney, 1925) will show:—

Ten days before the second storm, while the sky was cloudless and the air serene, a change in the quality of the heat was felt. During the first three months of the year—the period of heavy rainfall—the temperature is generally humid. Suddenly it became dry and burning, with a tingling intensity, as rare as uncomfortable. For the time the moist vapours of a mild steam-bath were dispersed by scorching breath as from a furnace, to the discomfort of animal life and the injury of vegetation.

Early on the morning of Sunday, 10th March, the sky became overcast. A fresh southerly breeze had sprung up during the night. A short, confused sea tumbled in the channel, and the usually placid bay mimicked its sport. . . . The wind developed as it veered to the east. At 5 p.m. it was travelling at furious speed, twisting branches from trees and thickening the now gloomy skies with leaves. Consistently with the strength of the wind the barometer fell until between 9 and 10 p.m., when, with a conglomeration of terrifying sounds varying from falsetto shrieks to thunderous roars, the centre of the cyclone seemed to bore down on the very vitals of the island.

The devastating assault lasted about half an hour; it was followed by a lull, succeeded by another attack of violence from the north and north-west; then, as orderly as the storm had developed, so it subsided.

The following are the readings of the barometer during the day:—

9 a.m.	29.90	5 p.m.	29.50
Noon	29.40	6 p.m.	29.60
3 p.m.	29.70	7 p.m.	29.30
4 p.m.	29.60	8 p.m.	29.18

As the 8 p.m. observation was taken, the unassisted finger dropped 2-100ths with a jerk, and within a few minutes the demons of the air were crazy with fury. That was the final reading for the night, for the crisis came with such ferocity that the wreckage of parts of the house made the site of the instrument inaccessible; nor was it possible to consult it again until shortly before nine o'clock the following morning, when it stood exactly at the point from which it had begun to move twenty-four hours before.

Only while the core of the storm was passing was lightning seen or thunder heard. Then the whole mass of tumultuously-racing clouds and vapour was luminous at frequent intervals, and the rumble of the thunder almost continuous. . . .

Throughout the night rain was incessant; but its torrential tramplings on the resonant, ceilingless roof were not to be detached from the discordancies of wind and wave, save only while breath was held in expectation of whatsoever might happen after the terrifying lull. The gauge overflowed at 10.50 in., so that the exact quantity for the twenty-four hours during which all ordinary concerns and interests were wafted aside cannot be stated; but, by comparison with results of previously recorded deluges, the fall must have exceeded 14 in., the greater volume of which should be ascribed to about five hours.

Being in perfect sympathy with each other's fury, wind, rain and sea, in a common tongue, spoke threats of ruin and devastation, and fulfilled them all in more or less degree. . . .

While the rage lasted, a slight degree of comfort was attained from considering the suddenness of the storm and its very violence. At its lowest the barometer indicated nothing out of the normal; but its marvellous activity as the wind gathered in force, the sensational drop immediately prior to the crisis, the recovery as the depression passed over, and the subsequently revealed fact that the course of the storm was brief—little over a hundred miles—show that it was home-brewed. Subsequent information proved that the dangerous phase was not experienced for more than twenty miles to the south and twenty-four miles to the south-west.

The admiralty hydrographic office in 1897 published the following remarks and advice concerning tropical hurricanes on the Queensland coast:—

Tropical hurricanes on the coast of Queensland may be expected during the summer months, namely, December, January, February, March, and the early part of April. These storms appear to originate between latitudes 8° to 12° S., and between the meridians of 155° E. and 170° W. On reaching the Queensland coast they may strike the land at any point between latitudes 12° and 26°—that is, between Cape Grenville and Wide Bay. To the southward of latitude 26° S. these storms break up into heavy gales. If, during the summer months, and the early part of April, a heavy swell sets in from north-east, and there is little or no wind at the time, bad weather is certain, for the sea always is in advance of a cyclone. With the glass steadily falling, heavy rains, and murky sky, winds between south-south-east and east a cyclone may be expected. These storms may extend some distance inland, but their centres do not often pass the coastal ranges, which appear to repel them, and they usually emerge from the coast between Broad Sound and Cape Moreton. If the barometer is high over a considerable portion of the coast, the storm will recurve some distance off the land, and the wind will be from south-east to south. If, on the contrary, the barometer is low in front of the storm, it will blow home on the land as far as the coast range, and cause floods. When this happens the first of the gale will be southerly, the latter part northerly. The bearing of the storm centre will be at right angles with the waves line. Thus, on a fine day if there is a heavier sea than usual breaking on the beach, and it is coming from the north-east, if the direction remains the same or nearly so, and the barometer is not above 30 inches, the gale will blow home on the land, and the first signs of bad weather will not precede the gale by more than 12 hours, but if the direction of the swell

changes to the eastward the storm is recurving, and the body of it will not reach the land. When the swell is from the east the storm centre is past; when there is anything southing in the line of the swell the storm has passed. No matter how threatening the weather signs may be, if the line of swell comes first from the southward, there will be only an ordinary south polar storm, with a low temperature.

H.A.H.

Methodist Church, The. The introduction of Methodism as an organized body into Australia dates from the evening of 6 March 1812, when a few laymen met in the house of Thomas Bowden in 'the Rocks' area at Sydney for the purpose of Christian fellowship. On 3 April, at a similar gathering (known in Methodist phraseology as a class-meeting), it was decided to request the Wesleyan Missionary Society in London to send a missionary to Sydney; Thomas Bowden and John Hosking, the leaders of the classes, signed the appeal on behalf of the society, and promised that, if a missionary were sent, he should be no further charge upon the society in London—a promise they were unable to fulfil. These leaders were subsequently joined by Edward Eagar, James Scott, and John Lees. Scott bought two allotments of land in Princes-street, and on one built a chapel at his own expense at a cost of 500 guineas. This, the first Methodist chapel in Sydney, he presented to the mission; it was opened on 17 March 1819, Walter Lawry (q.v.) being the preacher. Hosking (whose son became the first mayor of Sydney) came to the settlement through Marsden's influence in or about 1809 to take charge of the girls' orphan school established in August 1801 by Governor King. Eagar, an Irish attorney, had been visited by Methodists when he was under sentence of death for embezzlement; the death-sentence was commuted for transportation, and Eagar, when his sentence expired, settled at Windsor as preacher and teacher. He afterwards received an unconditional pardon from Macquarie in January 1818, entered into business in O'Connell-street, Sydney, and accompanied William Redfern to England in 1821 to plead the cause of the emancipists. Bowden, who reached Sydney on 28 January 1812, organized the boys' orphan school and taught there for some years. Lees was a private in the New South Wales Corps (q.v.); when it was disbanded he settled at Castlereagh, and built a chapel of rough slabs at his own expense, presenting the building and 3½ acres of land to the society in Sydney. This was the first Methodist chapel in the southern world. It was opened by Samuel Leigh on 7 October 1817.

The 'historic appeal' of 3 April 1812 was answered by the appointment of Samuel Leigh (q.v.), who arrived in Sydney on 10 August 1815, and preached his first sermon in Scott's house in Gloucester-street. On the next day Eagar introduced him to Governor Macquarie, from whom he received promises of support that were generously and faithfully fulfilled. Leigh and his co-workers rented a house in Gloucester-street at £15 per annum; this they adapted for divine worship, and Leigh preached in it every Sabbath day at 6 a.m. and 6 p.m. until the Princes-street chapel was opened—the hours being chosen to avoid interference with services conducted by the Anglican chaplain. When Leigh had organized the Church in Sydney he visited Castlereagh, Parramatta, the Hawkesbury River district, and Liverpool, preaching at each station and arranging for regular services where possible. In 1818 he was joined by Walter Lawry (q.v.) and in 1820 by Ralph Mansfield (q.v.) and Benjamin Carvosso (q.v.). In 1821 Lawry built the first chapel in Macquarie-street, Parramatta, largely at his own expense. To Newcastle Leigh went first in response to a request from the Anglican chaplain Cowper, and a second time through Macquarie's influence, preaching on both occasions in the church erected by the governor. Joseph Orton preached first at West Maitland (which he termed Hunter's River) in 1839; but Methodism had previously been introduced into that district by Jeremiah Ledsam, a lay preacher from Ireland. In 1832 Orton visited the Bathurst district, and conducted divine worship in the home of one Lane at Tarana, at Terry's farm, in William Lane's barn at Bathurst, and in the home of William Tom at Springfield. At Goulburn Matthew Trenery, John Wheatley, and John Simpson established services in 1842. To New England, the Riverina, the Richmond River, and the South Coast Methodism found its way later.

Tasmania.—In 1817 Leigh suggested to the Wesleyan missionary committee in London that a missionary be appointed to Tasmania, and Carvosso on his way to Sydney visited Hobart on 25 April 1820, and asked the governor's permission to hold an open-air service. Sorell referred him to the Anglican chaplain, Robert Knopwood, who welcomed him warmly and ordered the constable to accompany him to the service. Standing on the steps of the court-house with his wife, Carvosso preached to 100 people. In the following October Corporal George Waddy and two other Methodist soldiers were sent to Hobart. At the house of Benjamin Nokes in Collins-street they held their first class-meeting on 29 October, Nokes being the leader; a few days later they removed to the house of one Wallis in Liverpool-street, where services were held until better accommodation was found in the shed of a man known locally as Charles Donn—this was in Argyle-street, on the site occupied by the Bird-in-hand hotel between Liverpool- and Collins-street. Donn, whose real name was Cranmer, claimed to be a descendant of the archbishop. A Sabbath-school of 23 scholars, commenced on 13 May, was the first Sabbath-school in Tasmania. Nokes and one Butcher visited New Norfolk, where they held a service in the house of one Albe and proposed a plan for the building of a chapel. Corporal Waddy, who had been sent from Sydney to Macquarie Harbour, succeeded in starting a class-meeting there. In 1821, when Samuel Leigh, then general superintendent of missions, was returning from England, he called at Hobart on 8 August, accompanied by William Horton. Horton was left at Hobart where he began the erection of a church in Melville-street on land given by David Lord. Nathaniel Turner came to Horton's help for 12 months, Mansfield succeeded him in 1823, and in 1825 Carvosso took Mansfield's place, and completed the building of Horton's church. In 1822 John Hutchinson was sent from Sydney to Launceston, and in 1827 William Schofield (q.v.) was stationed at Macquarie Harbour with very beneficial results. John A. Manton, G. A. Robinson (q.v.), Captain Horton, John Leach, Frances French, and others assisted in establishing Tasmanian Methodism, and in 1835 Tasmania was constituted a separate district with Joseph Orton as chairman.

Victoria.—In 1836 Orton visited Port Phillip,

accompanied by John Batman, who had been a scholar in the Wesleyan Sunday-school at Parramatta. On 24 April Orton conducted the first religious service in Victoria, standing on the eastern slope of Batman's Hill. The liturgy was read, the responses given by the resident magistrate, James Simpson, and the singing led by Alexander Thompson, afterwards mayor of Geelong. Orton afterwards selected 64,000 acres at the head of Corio Bay for an aboriginal mission-station, later known as Buntingdale. Subsequently George Lilly, J. J. Peers, W. Witton, and others formed a fellowship meeting (with Witton as leader) in a house in Lonsdale-street, the first Sunday-school was held in Russell-street, and in 1838 the first chapel was built at the corner of Swanston-street and Flinders-lane. Benjamin Hurst and Francis Tuckfield, who were in charge of the Buntingdale station, preached in Melbourne once a month, the pulpit being filled on other occasions by E. S. Parker and James Dredge, assistant-protectors of the aborigines. Orton made a second visit in 1839, and in November of that year William Simpson of Launceston induced the Melbourne Methodists to secure a site at Eastern Hill, which was afterwards exchanged for half an acre at the corner of Collins- and Queen-street. In 1840 Orton took temporary charge of the work at Melbourne, finding on his arrival (3 October) 80 Church members and seven lay preachers, and held his first quarterly meeting in Russell-street on 28 January 1841. Samuel Wilkinson, the first resident minister, took up his residence in April 1841. The Collins-street chapel was opened that same year, the preachers being W. Waterfield, Orton, Tuckfield, and Forbes. New chapels were determined on at Fitzroy and Brunswick, and in 1842 James Dredge was sent to Geelong to superintend the work there. William Schofield was appointed to Melbourne in 1842, being succeeded by Edward Sweetman in 1845 and William Lowe in 1847; in the same year John Christian Symons and Robert C. Flockhart were accepted as the first local candidates for the ministry.

The Primitive Methodists date their foundation from 1849, when John Ride was appointed to Melbourne and erected a church at the corner of Lygon- and Latrobe-street. The first district synod was held on 9 September 1851 under the chairmanship of William Butters. The discovery of gold brought to Victoria many Methodists, who assisted vigorously in developing and extending the Church and its agencies.

South Australia.—Methodism in South Australia is coeval with the foundation of the settlement. Captain Morgan of the *Duke of York* (which brought out settlers) and Samuel Stephens, manager of the South Australian Company, were Methodists. The Methodists who arrived at Kangaroo Island and Holdfast Bay held their meetings in the manager's house and in a carpenter's shop; when a move was made to the present site of Adelaide, they met in scattered tents known as Buffalo Row, until Edward Stephens, brother of the first manager, placed first a storeroom and then a kitchen at their disposal. In the kitchen on 11 May 1837 a society was formed with two classes under the leadership of John C. White and Jacob Abbott. Thenceforward public services, prayer-meetings, and a Sunday-school were held regularly. A site for a chapel was selected in Hindley-street, where a roofless church was opened on 13 March 1838; the absence of a roof (through lack of roof-timbers) was made up for by the use of tarpaulins. The appointment of a missionary was next sought, and made unexpectedly; on 21 June the *Fanny* was wrecked on the Coorong beach (between the Murray mouth and Lacepede Bay), with William Longbottom (q.v.) and his wife and child on board, bound for Western Australia. Longbottom reached Adelaide on 17 August, where he was joyfully received and took charge of the infant church. A second church was built in Gawler-place, the foundation being laid by Sir George Gawler on 7 November 1838, and the opening effected on 7 July 1839. Longbottom the Methodist, J. Drummond the Presbyterian, and T. Q. Stow the Congregationalist preached at the opening. In 1840 Longbottom was succeeded by J. Eggleston, and he by John Weatherstone in 1842. John Wiltshire, a Primitive Methodist, conducted the first service in connection with that body in Light-square on a Sunday afternoon in June 1840.

The Bible Christian Church originated at Kapunda and Burra Burra, whither several Methodist immigrants and lay preachers had found their way. Their request to the English conference for ministers was responded to by the appointment of James Way and James Rowe.

Methodism in *Western Australia* also synchronizes with the foundation of the colony. The *Tranby*, one of the first vessels to reach Fremantle, was chartered by two Wesleyan Methodist families, the Hardeys and the Clarksons, who had with them several other Methodists, including G. Johnson. Soon after the arrival of the *Tranby* in February 1830, the first Methodist service in the colony was held 'amid a babel of noise and confusion.' Religious meetings were established at Peninsula Reserve, Joseph Hardey acting as leader. Meetings were also held at Perth and Guildford—Perth finally becoming the centre; divine worship was held there in the open air under a jarrah-tree in Hay-street. When a class-meeting was organized, James Inkpen was appointed leader. In January 1833 George Shenton and Charles and Bernard Clarkson joined them, and a meeting was held at Perth on 22 January 1834, when it was determined to erect a chapel. A site facing Murray-street was purchased from Inkpen for £5, and the church was opened on 22 June 1834, Joseph Hardey being the preacher. A Sabbath-school was commenced under the superintendency of Inkpen, and Joseph Hardey, J. W. Hardey, G. Lazenby, H. Trigg, and B. Clarkson, all lay preachers, were responsible for the services until the arrival in June 1840 of John Smithies, who remained in Western Australia until 1855. Smithies held service in the court-house at Fremantle on 19 July and on 9 September 1840

In *Queensland* the beginnings of Methodism are not traceable. Among the soldiers were some Methodists, Corporal Fursman being the only one whose name is remembered. In 1847 William Moore of Windsor, who was waiting for his commission as a missionary to Fiji, was sent to Moreton Bay, and commenced services in Queen-street near the present offices of the *Telegraph*. Land was obtained from the government in Albert- and Adelaide-street, and a church opened in 1849. Moore, who also commenced services at Ipswich, was succeeded by W. Lightbody, John Watsford, and J. G. Millard. A church was built at Albert-street, Brisbane, in 1856, and another at Ipswich in 1858; the present Albert-street church was built in 188′

Statistics presented to the last Methodist general conference, held at Brisbane in 1926, show: —ministers, 1116, 132 of whom are natives; home missionaries, 152; lay preachers, 8036; attendants on public worship, 606,117; Sabbath-schools, 3511 (1206 native); Sabbath-school teachers, 30,196; Sabbath-school scholars, 203,431; theological institutions, 5; theological students, 71; book depots, 5; churches, 3752; schoolrooms, 990; parsonages, 769; colleges, 16. The census of 1921 gave the number of Methodist adherents in Australia as 632,621—12.01 per cent of the population.

The first district synod was held in Sydney in 1826, under the superintendency of George Erskine. This district synod was the chief Australian centre of authority until 1855, when the first Australasian conference met under the presidency of W. B. Boyce. In 1874 this conference was divided, and colonial conferences established, with a general or federal conference meeting every three or four years. The first such general conference held after the union of all the branches of the Methodist Church met at Melbourne in 1904, under the presidency of William Henry Fitchett.

The foreign mission work which is one of Methodism's chief glories is described under MISSIONS. Home mission work has been equally successful. Reports submitted to the general conference of 1926 show that in New South Wales there were 15 agents employed and (largely through the depletion caused by the war) many stations in which home missionaries were needed; the income for the year was £10,745. In Victoria there were 76 home missionaries, 44 of whom were married; the income raised in advance was £25,940. South Australia employs 26 home missionaries, and its income is £6296; in Queensland home missionaries averaged 20 and an income of £3059; in Western Australia the income was £2156. The work of the home mission societies extends beyond the appointment of home mission agents. In New South Wales the society administers missions to the far west, the north-west, and the Riverina districts, loan-funds to assist in the erection of churches, parsonages, and schools, the Vickery settlement fund, and the James Woolnough sites fund. In Victoria the society employs qualified lay evangelists and a colporteur, appoints chaplains to the hospitals and gaols, superintends the immigration movement, and assists mission work in Western Australia by a monetary grant. In South Australia the society is responsible for work among the soldiers and at construction camps in the Murray valley and the Eyre peninsula; it also deals with immigration and group-nomination. In Queensland and Western Australia the societies work among the soldiers' settlements. Nearly all the states have sisterhoods, children's homes, and homes for the aged, and New South Wales has a worthy war memorial in the form of a hospital at Waverley. Central missions, found in each capital city of the Commonwealth, are not under the jurisdiction of the home mission societies.

In the earliest stages of Australian Methodism it was not possible to do much for higher education, but, since the problems of pioneer settlement have to some extent been overcome, educational work is receiving greater attention. Colleges affiliated to universities (q.v.), theological halls, and schools for boys and girls have been established. Wesley College at Sydney, Queen's College at Melbourne, and King's College at Brisbane, are the three affiliated colleges. Wesley College with an average of 40 students for 1924-5-6, erected at a cost of £40,000, is free of debt, as is Queen's College (121 students), a magnificent structure erected at great cost largely through the inspiration of its master, Dr. Sugden. King's College works in conjunction with the Presbyterian and Congregational churches. In New South Wales and South Australia independent colleges have been established for training theological students. Boys' schools include Newington College at Sydney, Wallaroi College at Orange, Wesley College at Melbourne, Prince Alfred College at Adelaide, Wesley College at Perth, and schools at Brisbane and Charters Towers; the two last-named have been recently established under the joint management of Methodists and Presbyterians. Girls' schools are more numerous; there are four in New South Wales, one at Melbourne, one at Launceston in Tasmania, one at Adelaide, one at Claremont in Western Australia, and in Queensland at Brisbane and Charters Towers, under the Presbyterian and Methodist Schools Association.

The figures given above have been taken from the general conference minutes of 1926—the last available official source—and therefore refer to the year 1925.

See George Blencoe's *The Faithful Pastor* (1857); *Life of Rev. S. Leigh* (1863); *Life of D. J. Draper* (1869); J. G. Turner's *The Pioneer Missionary* (1872); Dyson's *Samoan Methodism* (1875); *The Methodist History of Victoria and Tasmania* (1899); John Watsford's *Glorious Gospel Triumphs* (1900); Colwell's *History of Methodism* (1904) and *A Century in the Pacific* (1914); George Brown's *Autobiography* (London, 1908); *The Methodist Magazine* (1812-55); and *Conference Minutes* (1855-1926).

J.C.

Mica. See MINERALOGY.

Mice. See RODENTS.

Michael, JAMES LIONEL (1824-1868), born in London in 1824, practised law with his father, who was a solicitor, but found literature more congenial and spent his leisure hours in association with the pre-Raphaelite brotherhood. In 1853 the gold-fever brought him to Australia, but he soon found the diggings less remunerative than law, and before the end of the year was practising in Sydney. In 1857 he published *Songs Without Music*, a small volume of imitative but graceful verses; in 1860 appeared *John Cumberland*, an autobiographical sketch in verse. His best service to Australia was his encouragement of Henry Kendall (q.v.), whom he took into his Sydney office about 1858 and kept with him for a short time after moving to Grafton in 1861. On 28 April 1868 Michael was found drowned in the Clarence River.

Michie, SIR ARCHIBALD (1813-1899), born at Winchester in 1813 and educated at Winchester School, studied law and was called to the bar at the Middle Temple on 4 May 1838. Migrating next year to Sydney and being admitted to the local bar in November, he settled down to practise his profession, combining with it a good deal of journalism and joining Robert Lowe in the control of the *Atlas*; in 1848 he was elected first chairman of the Australian Mutual Provident Society. After a visit to England he returned to Australia in 1852 to settle in Melbourne, where he became a nominee member of council, dropped politics to own the *Herald* (then a morning paper), and lost heavily in the enterprise, but made his reputation by a successful defence of the Eureka rioters in 1855. From 1856 to 1872 he was a prominent figure in Victorian politics, representing Melbourne (1856-9), St. Kilda (1859-61), Polwarth

(1863-6), St. Kilda again (1866-8), and South Gippsland (1868-71) in the assembly, and sitting in the council during 1871-2. He was attorney-general in the Haines ministry of 1857-8, minister of justice in the first McCulloch ministry (1863-6), attorney-general in the third McCulloch ministry (1870-1), and in 1873 was appointed agent-general. This post he held until 1879, when he returned to Melbourne, retired from politics, and died on 21 June 1899.

Though a man of great culture and brilliance, his actual political achievement was small. In 1857 he interested himself in federation and in the problem of state education; but in after years he seems to have contented himself with influencing unobtrusively the cabinets and parliaments of which he was a member. (K.C.M.G., 1878.)

Micky. See MINERS.

Microscopical Society of Victoria. See SOCIETIES, LEARNED.

Migration. This article should be read in conjunction with IMMIGRATION RESTRICTION. On 10 July 1788 Governor Phillip begged the colonial office to send out free settlers, who would find employment for the convicts on farms, etc. In the 'additional instructions' issued to him on 20 August 1789 provision was made for the reception of migrants, who were to be given a free grant of land. On 16 January 1793 the first group of free settlers (eleven in all, including five adult males, being all who had so far offered themselves) arrived in the *Bellona*. They received a free passage, free grants of land, tools from the public stores, free sustenance for two years, and convict servants for whom the government undertook to provide two years' rations and one year's clothing. The land-grants—80 acres for married and 60 for single men—were located south of Homebush and Strathfield, the district becoming known as Liberty Plains. Other small groups followed, including one of Presbyterians from the Scottish border who arrived in 1802 and settled near Portland Head on the Hawkesbury. Macquarie, on taking office, objected to free immigration—especially that of 'gentlemen-settlers,' armed with letters from the colonial office, who 'imagine they have done H.M. Government so very great a favour by coming to New South Wales that no expense on the part of the Crown can repay the obligation, and the many great donations they receive from the Crown meet with no other return than discontent and ingratitude.' More objectionable still was the colonial office's habit of permitting applicants to send troublesome relatives to the colony, some of whom immediately sold their land-grant. Macquarie urged a limitation of the number of free settlers, and on his own responsibility inserted residence or cultivation clauses in the deeds of grant. His representations were favourably received, and on 3 February 1814 he was informed that great care was being taken that settlers should have sufficient capital for the cultivation of land, as well as testimonials from persons of known respectability. For those who had relatives in the colony the conditions were less stringent. Migrants were to be notified that they would only be entitled to draw free rations for six months. Later, it was decided to give no more free passages; on rare occasions settlers were permitted to travel in transports, but they had to pay for their provisions.

On 16 May 1818 Macquarie asked that no settlers should be allowed to come out who did not possess a capital of £500; experience showed that poorer settlers were unable to cultivate their grants, and drifted to the town. This request also was granted. In 1820, out of a total mainland population of 23,939 only 1307 had arrived as free settlers; for Tasmania the figures were 714 out of 5468. But the pressure of events could not be withstood. Despite the distress caused by the Napoleonic wars, the population of Great Britain had increased by 15 per cent between 1811 and 1821, and remedies for overpopulation were freely discussed. Numerous small capitalists applied in 1821 for admission to New South Wales, and especially to Tasmania, which had been highly spoken of as an agricultural country. So difficult did Macquarie find it to supply new settlers with land that a scale of land-grants proportioned to available capital was drawn up; the minimum capital required was £500. The practice of distributing free rations for six months still obtained, and cattle from the government herds were allotted to each settler, to be repaid in kind in seven years; but later in the twenties, as the stream of immigration broadened, these indulgences were discontinued. The number of free migrants to New South Wales and Tasmania during the twenties was:—1821, 320; 1822, 875; 1823, 543; 1824, 780; 1825, 485; 1826, 903; 1827, 715; 1828, 1056.

With the development of the pastoral industry the demand for assigned convicts exceeded the supply, and pastoralists experimented with the introduction of labourers under indentures for a term of years, but without much success. Distress in England and colonial labour requirements thus facilitated the adoption of Edward Gibbon Wakefield's proposals that colonial waste-lands should be sold at a 'sufficient price' and the proceeds used to promote the migration of labourers. On 14 February 1831 instructions were issued by the colonial office that henceforth lands must be sold, not alienated by grant, and a land fund created with the money thus obtained. On 24 June a board of commissioners was appointed in London to collect information for the use of migrants; at first no funds for emigration schemes were granted by the treasury, but the board might receive money from parishes for effecting the emigration of their paupers. On 28 September Bourke was informed that arrangements had been made to assist females to migrate to New South Wales, it being desirable to increase the proportion of females there; £10,000 was set aside towards the passage of unmarried females, preference being given to those migrating with families and to domestics suitable for employment in a farmer's family. Early in 1832 the first ship under this scheme was despatched, the women being chiefly from charitable institutions in Dublin and Cork. Meanwhile the commissioners had received many applications from persons—chiefly mechanics with families—willing to migrate, provided that the government made advances to be repaid from their earnings; the commissioners favoured this, recommending that families be granted a loan of £20 each family towards their passage, and the scheme was put into operation and was later extended to agricultural labourers. In 1835 the government undertook to pay for the full passage of female migrants, and converted the advances already made to labouring families into grants.

In New South Wales and Tasmania there was considerable discontent with the type sent out.

After functioning for a year, the emigration commissioners had resigned; their work was taken over by the colonial office, which relegated the task of selecting females to a voluntary committee of philanthropists. The actual selection was done by shipping agents, who wished to fill up the ships quickly; the result was unsatisfactory, and in 1834 Bourke suggested that a salaried officer should be appointed to supervise applications in England, and one was appointed at the beginning of 1835. Until 1833 the selection of mechanics and agricultural labourers had been left to the shipping companies; in that year a government agent was stationed at Liverpool, where most of the migrants embarked. The results, however, were still unsatisfactory, so in 1836 New South Wales (Tasmania was obliged to retard the rate of immigration) sent three naval surgeons to the United Kingdom to select and escort applicants to the colony. No females were to be accepted unless they belonged to, or accompanied, a family group; the men, preferably under 30 years of age and married, were to be one-third agricultural labourers and overseers, two-thirds mechanics. This method of selection was found expensive, and T. F. Elliott was appointed by the colonial office to exercise a general superintendence; early in 1838 he assumed full responsibility for assisted migration to New South Wales. In January 1840 a board of commissioners took over Elliott's work and also that of the South Australian commissioners (see SOUTH AUSTRALIA), since there had been an 'unseemly and injurious competition' between them. The board controlled the sale of crown lands and used the proceeds (except what was required for pressing local needs) to finance emigration.

The government system of selection had been severely criticized in New South Wales both on the ground of expense and because families with young children were brought out instead of single men willing to take up-country work; it was therefore decided, as a second and concurrent system of migration, to give to any private person who brought out married mechanics, or farm-servants under 30 years of age, a bounty of £30 per couple and proportionate allowances for children. A bounty was also payable on each unmarried female between 15 and 30 travelling with a family, and on single men, provided a like number of females were introduced. The bounties did not cover the full cost of passage, and were payable only if the migrants were approved by a special board on arrival. It was anticipated that employers under this scheme would secure the type of employees they required at a reduced cost to the public funds. Bounty migration, however, became a commercial speculation for shipowners, and liable to great abuses; nevertheless in 1839, when it was known that transportation was to cease, the legislative council of New South Wales recommended that bounties be increased to cover the whole cost of passage; this was done from March 1840, and during that year the government found itself pledged to pay about £979,600 on the arrival within two years of 71,315 migrants. During 1841 Gipps continued to issue orders, stipulating that the payment of bounties would be contingent on the state of the colony's finances; he apprehended no great inconvenience could result, since there was probably not enough shipping available to bring so many migrants to the colony; but the commissioners, alarmed by the increasing departures of bounty migrants from the United Kingdom, decided to suspend government emigration. To minimize abuses in the bounty system they undertook a supervisory control from January 1841, migrants and vessels being inspected, and a certificate issued to the master when all conditions had been complied with. Gipps appealed to the colonial office to check migration, and orders were issued that no bounty should be paid after November 1841. The bounty system was thus also suspended, although about 20,000 permits were still outstanding.

During 1840-1 there was a bitter controversy as to the respective merits of the two systems. The colonists said that the government system of selection was used to get rid of workhouse inmates and other persons of no value as settlers; the commissioners pointed out that these allegedly valueless migrants were readily engaged in good positions. In December 1839 a committee of the New South Wales legislative council reported that the bounty system was 21 per cent cheaper than the selection system. This report, however, was made before the bounties were increased. The mortality in government ships was less than in those under the bounty system, and on arrival government migrants were housed in barracks, and fed until they found employment; on the other hand, the practice of disembarking bounty migrants without making provision to house them temporarily—which obtained until 1840, when ten days on shipboard were allowed—led to serious hardships. Indeed, had it not been for the work of Caroline Chisholm (q.v.), the rush of bounty migrants in 1840-1 would have resulted in the stranding of large numbers of deserving people.

The Australian waste lands act of 1842 laid down the principle that the cost of survey, management, and sale of land should be a first charge on the land-fund, and that the remainder should be divided into two equal parts, of which one was to be devoted to migration. When needed, additional funds were raised by the issue of debentures. Under these provisions the colonial office in September 1843 decided that migration to New South Wales might be resumed on a small scale under a modified bounty system—bounty tickets to be issued in London for a specified number of migrants, for whom shipping contractors must provide passages through the colonial office. The commissioners undertook to inspect the ships and to protect migrants from fraudulent practices, but the risk of selection was left with the contractor, as bounties were not payable unless the migrants were approved either at Port Phillip or Sydney.

Towards the end of 1843 Gipps wrote that the colony could not then absorb many more migrants, and in July 1844, when 2614 had been sent out under the new arrangements, it was decided to postpone such other agreements as had been entered into. Recruiting ceased in 1845, and in 1846-7 no one arrived at government expense.

There had been much discontent at the proportion of Irish sent out under the bounty regulations; between January 1841 and June 1842 the proportion had been over 60 per cent. The commissioners explained that religion was not taken into account by them, and that the Irish offered more freely than others. At the instance of Dr. Lang (q.v.) a committee of the N.S.W. legislative council suggested in

1845 that 'whatever number of emigrants may henceforth be introduced ought to be derived in equal proportions from the three kingdoms.' Lang determined to counteract the Irish influence in the colony by the introduction of Scottish families into the Port Phillip and Moreton Bay districts. For the results of his scheme see LANG, JOHN DUNMORE, and COTTON.

Free migration was revived in 1848, but in the following year the commissioners reverted to the earlier system of assistance, a minimum charge of £2 being made for farm-hands and domestics, £5 for mechanics, and £7 for labourers; friends in the colony were permitted to nominate on payment of the minimum charges. Buyers of land who required labourers were permitted to nominate prospective employees. In certain cases bounties were allowed on Europeans introduced for special purposes, e.g. vine-culture. Private societies assisted individuals and groups to reach the colony, and the Family Colonization Loan Society (see CHISHOLM, CAROLINE) assisted families which were permitted to travel in the commissioners' ships; young women and girls from workhouses and boys and girls from ragged schools were helped by poor-law authorities and charitable institutions. Special provision for the reception of migrants was made in 1848, depots being prepared at Sydney, Melbourne, Parramatta, Goulburn, Bathurst, Maitland, and Moreton Bay, at which food and lodging were provided until offers of employment were made which the superintendents deemed fair. In the period 1832-50 89,251 migrants were introduced into New South Wales at public expense (including a few sent to Tasmania). During the same period 27,008 unassisted migrants arrived.

When gold was discovered in New South Wales in 1851 it was thought that migrants would flock thither, and the commissioners were asked to stop selected migration as soon as the funds in hand were absorbed. However, the Victorian fields attracted such large numbers from New South Wales that these instructions were countermanded, and the nomination system was further extended, as it was thought that family ties would keep nominees in the colony. To retain assisted migrants, an act of 1852 required that males and unmarried women should on arrival enter into an agreement to serve an employer for a term of two years at the current rate of wages, and to repay out of their wages the advance made towards their passage; repayments were to be made by the employers, who were allowed to deduct them from the migrants' wages. A migrant might at once repay the moneys due to the government, or might release himself at the end of a year's engagement by paying the second instalment. Altogether about 20,000 arrived in the colony under this new agreement, but many difficulties arose in connection with it, and towards the end of 1855 the clauses relating to indentures were repealed. The act of 1852 also provided for the private introduction of migrants under contract of service for five years; but very few were attracted, and it was decided to allow bounties on aliens introduced under two-year indentures. The German, Swiss, and Italian labourers who came out were generally considered more satisfactory than the British. During the period 1851-7, 56,530 persons were introduced into New South Wales at the expense of the land-fund.

Meanwhile the control of this fund had been transferred (by the constitution act of 1855) from the colonial office to the local legislature. No provision was made for allotting any part of it to immigration purposes, and thenceforth necessary funds had to be provided by parliamentary vote. Assisted immigration was unpopular among the employee class (see TRADE-UNIONISM), and it was proposed to substitute for it an offer of free land to migrants who paid their own passage. This suggestion originated with Dr. Lang, who had tried it in connection with his Moreton Bay parties; but it was not adopted, as the new land policy of 'free selection before survey' seemed likely to attract small farmers. In 1861, to further this result, Henry Parkes (q.v.) and W. B. Dalley (q.v.) were sent to Great Britain for a year to make known the advantages of New South Wales's new land act, but their mission was unsuccessful, partly because of the superior attractions of the Queensland scheme. After 1866 no further vote was made for immigration, and in December 1867 the nomination regulations were repealed. In 1869 there was some agitation for the renewal of assisted immigration, but a bill on the subject was withdrawn—largely owing to the attitude of Parkes, who opposed it on the ground that the colony had no agent in London to supervise selection.

In 1870 a select committee of the New South Wales legislative assembly recommended that an agent-general should be appointed with power to act as emigration agent; that greater facilities for settling on the land should be offered to migrants; and that the number selected from the three kingdoms should be proportionate to their population. As there was much unemployment in Sydney at the time, the revival of assisted immigration was bitterly opposed at public meetings and by deputations, and the bill was dropped. However, the emigration commissioners were authorized to send out domestics, and a few married persons accustomed to farm-work who were to look after the young women on the voyage. When Parkes became premier in 1872 he secured a vote of £50,000 to be expended during 1873 in assisting migrants selected by the recently appointed agent-general, Sir Charles Cowper. A denominational quota was determined by the number of persons professing each religion in the colony, and provision was made for limited immigration from Europe and the United States and for nomination by colonists. Only about 2000 persons were introduced during 1874-5, and in 1875 an unsuccessful attempt was made to take control out of the hands of politicians. In 1876 an act was passed validating contracts of service entered into by employers with foreigners, so long as the contracts were witnessed by authorized persons abroad and subsequently ratified in the colony. A few migrants were introduced at public expense during the next few years, but in March 1886 the nomination system was terminated (except as regarded settlers who wished to send for their families), and in October the agent-general was instructed to select no more. Early in the following year parliament decided to make no further provision for assisted migration beyond what was required to carry on existing contracts, under which migrants continued to arrive for a few years—but their total was only 1994. In 1873-93 New South Wales gained by assisted migration about 58,000 persons, and by unassisted about 231,000.

VICTORIA.—After separation from New South

Wales in 1850, Victoria took over the administrative machinery in Melbourne. Half the proceeds of the land-fund (after the deduction of certain expenses) were available for immigration, and arrangements were made with the commissioners to give assistance to farm-servants and shepherds, a limited number of artisans, and female domestics; provision was also made for assistance to migrants nominated by friends in the colony or by persons who had deposited money for the purchase of land; but nomination by land-buyers was discontinued in 1851, as it led to fraudulent practices. Many immigrants reached the colony without assistance, or with the help of charitable organizations. When gold was discovered in 1851 labourers everywhere left their jobs to try their luck on the fields, and a great scarcity of labour was felt in all industries; to meet this the regulations governing both selected and nominated immigration were relaxed for men bringing their families with them, as it was thought they would be less likely than single men to risk the hazards of the fields. During 1852 15,477 migrants were assisted to Victoria, as compared with 2551 the previous year. A committee appointed by the legislative council in 1853 reported that many of the newcomers were unsuited to colonial life, and recommended that assisted immigration should be confined to young single women, married mechanics, and married farm-labourers. Under these conditions the commissioners found it difficult to use the funds at their disposal without accepting large numbers of Irish applicants, who were objected to by an influential section of the community. The colonists also blamed the commissioners (quite unfairly) for the character of some migrants sent out by private institutions—not, however, by the Family Colonization Loan Society.

Meanwhile, as a result of the gold discoveries, a large number of persons had arrived without assistance, and in 1852-3 the government was obliged to make provision for housing them temporarily in Melbourne. Wooden buildings were hastily erected in which migrants were accommodated for ten days at a low charge, and the government subsidized private efforts to ameliorate the unusual conditions. During 1852 the colony's population increased from 97,000 to 168,000; the rush continued during 1853, but declined in 1854-5, by which time news of the disappointment that dogged the steps of so many prospectors was being circulated abroad.

When the first 'responsible' parliament met, considerable opposition to assisted immigration became evident, especially from members who relied on working-class votes. As parliament now controlled the funds, this opposition resulted in a vacillating policy. In 1860, when conditions had somewhat improved, regulations were made providing for the issue to colonial nominators of passage-warrants which could be used by male nominees on any available vessel; females must either form part of a family group, or travel in the ships of the land and emigration commissioners, who were still authorized to send out domestics. By the land act of 1862 one-fourth of the land-fund was set aside to assist migration from the three kingdoms in definite proportions; this remained in force until 1869. In 1863 an immigration act was passed which provided machinery for the use of the money thus allocated—by an agent-general in London, with four commissioners and a number of sub-agents; the act, however, was not enforced, and the land and emigration commissioners continued to act for the colony until 1869, though only a few thousands were sent out annually, owing to local opposition. A few specially skilled migrants were introduced from Europe. In 1869 the control of migration at the British end was taken over by the recently appointed agent-general, Sir George Verdon. The number of assisted migrants during the decade 1861-70 was 44,836, of whom 23,064 were Irish, 16,525 English, and 5247 Scotch; excluding these figures, the excess of arrivals over departures from 1 January 1865 to 31 March 1870 was only 7748. Some sections of the community desired the development of a more vigorous policy. There was sufficient support in 1870 to pass a vote of £65,600 for assisting selected and passage-warrant migrants, but in 1871 it was decided to terminate selection, and in 1872 the passage-warrant system was also brought to an end, except for some outstanding contracts which expired in 1873.

QUEENSLAND.—State-aided immigration has been an important factor in the development of Queensland. Reference has already been made to the advocacy by Dr. Lang of a land-grant to migrants who paid their own passage and would presumably be of a good middle-class type. When separation from New South Wales was effected, the system in operation in the mother-colony was at first continued, £5000 being voted in 1860 for the introduction of nominees and a few domestics, farm-labourers, etc., sent out by the land and emigration commissioners. But in the crown lands act of 1860 Lang's principle was adopted, provision being made for the issue of a land-order for £18 to any person coming from Europe at his own expense, or to any person who paid for the passage of a migrant; after two years' residence in the colony a second land-order for £12 could be claimed. Migrants claiming land-orders must come within the immigration regulations in force in the colony. On 9 October 1860 Henry Jordan was appointed emigration agent in England, to make known the advantages of the land-order system. He arranged for a direct shipping service to Queensland, carrying both paying passengers and persons whose passage-money was recouped by transferable land-orders issued in the colony. In January 1863 a supplementary scheme provided assisted passages for migrants willing to pay part of their passage-money without establishing a claim to a land-order. In 1861-3 about 17,000 persons reached Queensland under these schemes, the greater number being small capitalists with their families. Until 1863 most migrants came from England and Scotland, no agent having been appointed in Ireland; this occasioned discontent among the Irish, and a Queensland Immigration Society was formed (under the chairmanship of Bishop Quinn, q.v.) to extend the scheme to Ireland. The society was dissolved in the following year, and an agent appointed in Ireland. Arrangements were also made to secure about 2000 agriculturists from Germany, a considerable German population being already settled in Queensland. But the land-order system was abused; many migrants parted with their orders to land speculators, only to find themselves competing in the labour market on unsatisfactory terms. The government therefore decided to bring the land-order system gradually to an end, reverting to selective and nominated migration under the supervision of the land and emigration commissioners —who had continued to send out small groups of domestics. Jordan, faced with the destruction of

the system he had so elaborately built up, returned hurriedly to Queensland and induced the government to appoint a committee, which recommended the continuance of the land-order system with modifications. Each eligible applicant should receive a £30 land-order, but the deeds for the land should not be acquired until after two years' residence; the government should repurchase shippers' orders at a fixed price; migrants should be selected from the three kingdoms in proportion to their population, and not more than 1000 'statute' adults should be admitted annually from Germany. In 1864 the colony's first immigration act gave effect to these recommendations, and Jordan returned to England. Early in 1865 he was instructed to give free passages to nominees of Queensland railway contractors, selected through private agents; some of them were undesirable, and there were unpleasant incidents on their arrival. Moreover it was a time of financial distress in Queensland, and in September 1866 Jordan was instructed to terminate migration at public expense. The gross amount appropriated to the migration fund from 1 January 1860 to 31 December 1867 was nearly £580,000, of which £77,000 had been spent by the commissioners on the despatch of 8360 adults. During the same period 32,529 adults had been sent through the agency-general, and 5183 adults had arrived from Germany, making a total of 46,072 persons sent from Europe under some form of government supervision. The nominal value of land-orders issued was £660,072.

A select committee of the legislative assembly recommended in February 1868 a resumption of the land-order system with further modifications, but not until 1869 was an amending act passed; this provided for the issue of a non-transferable order for 40 acres of land to each full-paying passenger, subject to the homestead conditions of the land act of 1868. Provision was also made for assisting nominated and selected migrants, and for the grant of a number of free passages; but assistance granted by government had to be refunded within a stated time. When the repayments were made, the migrants became eligible for a 40-acre order on the same conditions as full-paying passengers. Employers were permitted to introduce migrants under a two years' agreement through government agents, if they guaranteed repayment in case of the migrant's default. At the end of two years the land-order would be issued to the man who made the refund. Employers were allowed to engage migrants at the depots on similar terms. Domestics, who were not required to repay their passage-money, had no claim to a grant. The quota system for migrants from the three kingdoms was to be continued, but the German quota was raised to 2000 per annum. It was estimated that the colony could absorb 6000 migrants per annum. An agent was sent to England and another to Germany, but the Prussian government refused to allow the indenturing of Germans. To many migrants the land-grants were valueless, as they lacked either the capital or the experience to cultivate land. Nor was it easy even for a migrant with experience and some means to find suitable and accessible land on which to settle. In 1872, therefore, orders were again made transferable, but the system had come into disfavour, and in 1875 the government decided to bring it to an end. In a parliamentary debate on the subject it was said that not more than two or three per cent of migrants entitled to land-orders had actually settled on the land; instead, they had by one means or another disposed of their orders to speculators and land-jobbers, at a discount in some cases of 75 per cent. Squatters found this an easy way to acquire, under the pre-emptive rights attached to their leases, the most valuable portions of their runs—the land-order system, it was said, turned the Darling Downs into a sheep-walk. But the amending act of 1875 was so clumsily drafted that another bill had to be introduced in 1882. Despite all these difficulties many assisted migrants arrived during the seventies—29,000 in 1870-6: in addition there was a continuous immigration from the other colonies, and the net gain to the population during the seven years was about 55,000. Assisted immigration was continued in 1877-8, restricted in 1879 owing to unsatisfactory economic conditions, and revived on a small scale in 1880, when there came into force an arrangement between the government and a shipping company for a regular service of steamers via Torres Straits to Brisbane.

By the act of 1882 the government was authorized to grant free and assisted passages, more assistance being given to nominees than to selected migrants; employers might also introduce migrants under contract through government agents on the same terms as nominees, and such contracts were validated in the colony by the act, as it was doubtful whether they could otherwise be enforced. No provision was made for repayment, but any person who came at public expense with the intention of leaving immediately might be fined £50 with or without imprisonment; leaving, or attempting to leave, within three months was made *prima facie* evidence of having arrived with intention to leave. In 1884 a land act set free for closer settlement large pastoral tenancies, but no special provision was made to attract small agricultural capitalists from Great Britain and Germany. In 1886 Griffith suggested that the land-order system might be satisfactorily worked if land-orders were used in payment of rent for crown land; a migrant taking up a selection of (say) 160 acres would pay his rent for five years with a £20 land-order and then under the land act get a free grant of it. This proposal was embodied in the crown lands act amendment act of 1886—Jordan being at the time minister for lands—and continued in force until repealed by the crown lands act of 1894. During the 1880s there had been a large influx of persons nominated by friends and, to a limited extent, by employers; free passages were no longer granted, and few availed themselves of the assistance offered to selected migrants. The immigration act of 1887 reduced the assistance given to nominees; this reduction did not apply to persons nominated by employers and coming under contracts of service, but there were few applicants of this kind. From 1892 to 1896 no assistance was given to migrants, except in respect of engagements already entered into; the practice was revived on a small scale from 1897 onwards, and at the time of federation a few domestics and agricultural labourers were being introduced.

SOUTH AUSTRALIA.—The land-fund of this settlement was originally intended for assisting the passage of migrants either selected by the South Australian commissioners or nominated by land-purchasers; migrants sent out at the expense of the land-fund were supported by the government until they found private employment. Gawler placed large numbers of them

on government works at reduced wages but in comparatively comfortable circumstances, so that many refused to face pioneering hardships—this situation helped to bring the colony into the difficulties from which Grey rescued it. Meanwhile the commissioners had in 1840 been absorbed into the newly-appointed board of land and emigration commissioners, who in 1841 suspended emigration to the colony. Under the land act of 1842 half the land-fund (minus certain expenses) was placed at the disposal of the commissioners for migration purposes, but it was not much used until 1845, when free passages were given to agricultural labourers, country mechanics, domestics, and a few miners. Philanthropic societies were also sending out migrants, partly at the expense of the colony, including children from the ragged schools, who were usually bound over by a local apprenticeship-board to responsible persons for three to five years. In 1845-51 21,770 migrants received government assistance; in addition, 34,659 (including 6700 Germans) came out at their own expense during the period 1844-51.

During the Victorian gold-rush of 1851-2 large numbers went thither, and it was obviously unwise to continue assisted immigration, except for nominees. Moreover the system of allowing land-purchasers to nominate persons for a free passage had been abused, and was shortly afterwards abolished. To keep the new settlers in the colony the commissioners bound them over to reside there for a definite period unless they repaid the money advanced; but it was found impracticable to enforce this agreement. However, successful diggers, returning with their gains, took up agricultural pursuits and created an increasing demand for labour, and more liberal assistance was given, but in 1855 the government found itself obliged to provide for about 1100 young women from Ireland and to open relief works for men. In 1857, after the grant of responsible government, the land-fund was merged in the general revenue; but, labour being again in demand, an immigration act of that year provided for the appointment of an agent in London to take the place of the commissioners. In January 1858 regulations under the act were issued, assistance being offered to both selected and nominated migrants (but not to Germans), who were required to stay two years in the colony. For migrants introduced at their expense settlers of a year's standing might receive a certificate with which land might be purchased. In 1860, owing to a depression in trade, assisted immigration was again suspended until the following year, when £25,000 was voted for it from the land-fund. In 1863 the 'Sutherland' act reserved one-third of the annual land-fund for immigration, which was thus freed from the vagaries of politics. Nevertheless, owing to an industrial depression in 1867 it was found impossible to utilize the funds thus made available; between 1 July 1863 and 30 September 1867 only £173,473 was expended out of an available £442,355. Between 1853 and 1866 46,942 'statute' adults came out at the public expense, of whom 27,445 were English, 14,134 Irish, and 5363 Scotch; the largest number in any one year was 10,584 in 1855.

In 1872 a new immigration act introduced a land-order system similar to that in operation in Queensland. Approved persons arriving at their own expense were to receive a land-order warrant for £20 per adult, which after two years' residence would be accepted by the government in payment for land. Introducers of approved migrants from Europe received a transferable order for £16 for each migrant who remained two years and (if a foreigner) became naturalized. Provision was also made for assisting nominees of residents who were natural-born or naturalized British subjects. The necessary funds were provided by annual votes. Lecturers were sent to Europe, but very few persons took advantage of the land-order system, and towards the end of 1876 it was decided to encourage nomination by allowing free passages to nominees. In 1873-6 12,175 assisted migrants of all classes were introduced. In 1877 it was decided to reduce assisted immigration to one ship-load monthly, and in 1886 the immigration regulations were suspended.

WESTERN AUSTRALIA.—Up to 1900 migration to Western Australia was spasmodic. Incomers up to the end of 1830 were entitled to a grant at the rate of 40 acres for every £3 of capital invested and 200 acres for the passage of each labourer paid by them; special terms were arranged with a few capitalists, notably with Thomas Peel and Colonel P. A. Lautour (see WESTERN AUSTRALIA). During 1831 this system was retained, but the size of the grants was reduced. When in that year land-sales were substituted for grants, such vast tracts of virgin country had been alienated that late-comers had difficulty in finding accessible land. Moreover, from the beginning there had been trouble between masters and their indentured servants, and the land-fund was too small to finance an assisted-immigration scheme. As a result the population, which numbered 1500 in 1832, had increased to only 4600 in 1849. An attempt had been made to check dispersion by a closer-settlement scheme at Australind (q.v.), and a few hundred migrants were introduced during 1841-3, but the settlement did not prosper. Early in 1850 a Colonization Assurance Company was formed in England to assist emigration to British colonies (see HUTT, JOHN) and about 100 migrants were sent to Western Australia. From 1850 to 1868 the colony received convicts under an agreement that as many free persons as convicts should be sent out; at first free settlers were sent at the rate of a few hundreds a year, but so difficult was it to obtain employment in competition with the ticket-of-leave men that the British authorities suspended free migration. In 1868 the legislative council of the colony was faced with the problem of labour-supply, and in 1872 residents were allowed to nominate friends or employees on depositing one-fourth the passage-money, the rest being found by the government. Efforts were also made to introduce settlers from the eastern colonies and from Europe, but without much success. In 1874 a select committee recommended that each 'statute' adult brought out at public expense should, after two years' residence, be entitled to select 50 acres of unimproved land, the fee-simple to be granted at the end of three years if certain specified improvements were made. This recommendation was accepted, and in August 1874 it was decided to devote £10,000 to immigration; E. H. Laurence, a resident magistrate of the colony, who was then in England, was instructed to make preliminary arrangements for the selection of applicants and for the despatch of nominees. When Laurence returned to the colony, this work was carried on by a 'colonial immigration committee,' consisting of a number of persons interested in the colony, but the result was not satisfactory. From 300 to 500 migrants

were sent out annually until 1878, when assistance was limited to a few nominees; in September 1879 it was unanimously agreed by the council that free land-grants should be discontinued. Meanwhile employers had turned to Asia for labour, especially for the development of the newly-opened Kimberley pastoral district.

In 1883 it was decided to appoint a board to administer a special fund of £20,000 for the introduction of 1000 migrants from Britain within the next two years, and the board was appointed on 6 November 1883. The crown agents in London were directed to supervise selected and nominated migrants; domestics and agricultural labourers were specially in demand, but the colony was also prepared to take lads from farm-schools as suggested by Laurence in 1874. Each applicant for assistance over 15 years of age was required to sign an undertaking to stay in the colony at least 12 months; any migrant leaving or attempting to leave within three months of arrival would be liable on conviction to a fine not exceeding £50 with or without imprisonment. Employers were permitted to use the crown agents or to select through private agencies. No provision was made for land-grants. Most of those sent out were nominees (a class specially approved of, as private interests tended to keep them in the colony), but a few were small capitalists. In November 1886 the immigration board, in view of an expected influx of migrants under the new railway schemes, decided to abolish free passages (except to a few domestics) but to continue the introduction of nominees at £6 each.

In 1884 a syndicate agreed to construct a line of railway from Albany to Beverley (243 miles), receiving in return a grant of 12,000 acres per mile constructed, the government retaining half the frontage to the line in blocks alternating with those chosen by the syndicate; an associated company, the Western Australian Land Company, would open up the land-grant, introducing 700 to 1000 settlers annually until the total reached 5000. A similar agreement for a line from York to Geraldton was made in 1886 with the Midland Railway Company of Western Australia. During 1886-7 the Western Australian Land Company introduced 1165 'statute' adults, but made no attempt to prepare the lands for settlement, and the colonization scheme was therefore a failure; in June 1887 it was arranged that only labourers required for the railway works should be introduced. The Midland Railway Company did not begin to open up its lands for settlement until 1900.

As the supply of labour was by 1888 in excess of the demand, the immigration board decided to reduce assistance still further. Owing to the gold discoveries of 1893 the colony between 1893 and 1900 gained from the eastern colonies (especially from Victoria and South Australia) about 108,000 persons. In those years assistance was given only to about 135 nominees yearly, most of whom were women. In September 1896 the legislative assembly resolved that farm and other labourers should be attracted to the colony, and that Dr. Barnardo should be invited to send out some of his boys; Forrest, then premier, promised to instruct the agent-general accordingly, but nothing came of it.

TASMANIA.—Under the assisted-migration policy of 1831 migrants were sent almost equally to Tasmania and to New South Wales, but in 1836 the island found it necessary to take fewer. In 1840, when assignment practically ceased, a large demand for labour was expected; bounty regulations like those adopted in New South Wales were put into operation in 1841, but were suspended in 1842. For the next few years the overplus of convict labour and the financial embarrassment of the government led to a loss of free population, and practically no free persons arrived until 1849—when, in accordance with the policy of Lord Grey, free settlers were sent out to offset the transportation of convicts. In 1852 a committee of the legislative council recommended that employers should be assisted to introduce indentured labourers; but the colonial land and emigration commissioners opposed the scheme, and it was limited to the appointment of an agent in Melbourne to select labourers from among disappointed gold-seekers on behalf of employers who contributed to their passage across the strait. Under this scheme about 1500 persons reached Tasmania in 1853-4, but were not very satisfactory, and in October 1854 the government withdrew its assistance. Meanwhile the council had been devising a bounty system which could be taken advantage of by employers or friends (bounty tickets in blank were also issued to overseas agents, charitable organizations, etc.), the migrants remaining in the colony for at least four years. In April 1854, in addition to the funds already at the disposal of the land and emigration commissioners, £50,000 was voted to carry out this scheme.

In 1856, assisted immigration having been temporarily suspended, a board of local immigration commissioners was appointed, and authorized to raise funds; the bounty system was resumed, though the issue of bounty tickets in blank was discontinued. But it proved difficult to retain migrants—indeed only in 1853, 1855, and 1857 did the number of arrivals materially exceed the number of departures. In 1864 a select committee suggested the issue of land-grants to full-paying migrants, and the immigration act of 1867 authorized the appointment of agents in Europe to grant land-order warrants; but in 1867-72 the land selected under this scheme totalled only about 1500 acres. Labourers were introduced in 1873 for the construction of the Hobart-Launceston railway, and with the development of tin- and gold-mining during the following decade conditions in the island improved. The immigration act of 1882 retained the land-order system and provided for assistance to other classes of migrants; an immigration board was set up, and given £10,000 per annum for three years to establish a satisfactory scheme; agents were sent to Europe, and about 2700 persons were introduced. In 1885, however, the board was dissolved and the migration policy practically abandoned, though assistance was given to a few nominees until 1891.

During the nineties none of the Australian colonies had any vigorous immigration policy, and in 1892, and again in 1898-1900 Australia lost population by departures in excess of arrivals; there was also during this period an intercolonial movement to Western Australia and Queensland. During the period 1861-1900 the net immigration (excess of arrivals over depar-

tures) into the Australian colonies was (including assisted and non-assisted migrants):—

Years.	N.S.W.	Vic.	Q.	S.A.	W.A.	Tas.	Total.
1861–65	11,562	5,656	52,855	16,263	4,165	–4,355	86,146
1866–70	33,309	30,218	15,041	965	1,699	–813	80,419
1871–75	29,741	–5,595	37,423	4,607	–98	–4,416	61,662
1876–80	73,459	–5,865	21,684	38,033	–49	2,880	130,142
1881–85	109,863	27,786	82,393	–2,082	3,658	2,422	224,040
1886–90	52,565	86,231	33,325	–24,205	8,179	2,606	158,701
1891–95	21,464	–46,848	4,666	471	47,201	–4,562	22,392
1896–1900	–997	–63,582	9,022	–15,866	68,996	4,914	2,487

(The minus sign indicates an excess of departures over arrivals.)

THE COMMONWEALTH.—Under the constitution the federal parliament was given power to legislate concerning migration, and in 1901 an act was passed embodying the 'White Australia' policy and specifying certain undesirable classes whose entry into Australia was prohibited (see IMMIGRATION RESTRICTION). But the restriction of undesirable immigrants is only one aspect of migration policy in a new country, remote from the original centres of its racial stock, where the development of natural resources waits on an increase of population. In 1904 Alfred Deakin (q.v.), then prime minister, declared it to be 'a matter of urgency to find some means of attracting the population needed to enable the Commonwealth to maintain her responsible position in these seas;' from that time onwards the problem of partially diverting to Australia the stream of settlers that flowed naturally from Europe to America was frequently before the Australian public. In 1905-6 suggestions were made that agricultural migrants might be obtained more easily from Europe than from Great Britain, and in 1905 Sir T. Coghlan, then agent-general for New South Wales, was instructed to make enquiries on the continent; he found, however, that most governments in northern Europe disliked losing their nationals by emigration. Meanwhile public opinion in Australia showed a bias against continental migrants; an Immigration League formed in New South Wales towards the end of 1905 was split on this issue, and a British Immigration League, the objects of which are indicated by its title, was organized. At the imperial conference of 1907 Deakin submitted a resolution 'that it is desirable to encourage British emigrants to proceed to British colonies rather than to foreign countries, and that the Imperial government be requested to co-operate with any colonies desiring immigrants in assisting suitable persons to emigrate;' but the British government was not prepared to subsidize emigration except by supporting the emigrants' information office which had been established in 1886 by the colonial office. Nor could the Commonwealth government enter on any active immigration campaign without the co-operation of the States, since the reception and distribution of migrants was a State and not a federal function. The Labour party opposed the assistance of any persons except settlers on the land —others might become competitors in the labour-market of the cities, which was frequently overstocked; and, since nearly all suitable land within reasonable distance of railways or other means of transport was in private hands, the provision of land for new settlers involved either the resumption of private estates or the development of railways and irrigation works. This could be done only by the States; the only Commonwealth instrument of closer settlement was a land-tax passed in 1910 by a labour government, for which see LAND LEGISLATION. Failing to secure general agreement among the States, the Commonwealth government refused to take control of the migration machinery in Great Britain, and limited its activities to a general advertising campaign which was begun in 1910; in the same year a 'Scottish Agricultural Commission' was invited to Australia to enquire into the prospects for British settlers, and its report, issued after a four months' tour (September 1910-January 1911), helped to stimulate British interest in the Commonwealth.

Meanwhile the States had taken independent action to encourage migrants for whom there was a special demand. Western Australia and Queensland had for a number of years been giving assistance intermittently and on a small scale; this they increased in 1906-7. Assisted immigration was re-introduced by New South Wales (1906), Victoria (1910), South Australia (1911), and Tasmania (1912). All States assisted nominees, but, as the majority of nominees were of the artisan class, it became necessary to recruit domestics and agriculturists. Occasionally specially skilled artisans were also introduced; Victoria under an agreement made between the government, the employers' federation, and the trades hall council brought in 1105 artisans and about 1000 factory girls in 1912. Special measures were taken to attract small capitalists with agricultural experience. For a time Queensland permitted agricultural settlers to select their holdings before leaving Great Britain (see BELL, SIR J. P.). In Victoria, New South Wales, and to a less degree South Australia, there was a demand for skilled irrigationists, and special facilities were given to experienced farmers from the western United States who wished to take up holdings (see IRRIGATION AND WATER CONSERVATION). In May 1910 the Victorian government sent Hugh McKenzie, minister for lands, and Elwood Mead, chairman of the State rivers and water-supply commission, to tour Europe and America in connection with its closer-settlement scheme; in July 1912 an officer was stationed in San Francisco to give information to applicants, and in the following year a lecturer was sent through America for the same purpose. Western Australia suffered in comparison with the eastern States because little was known in Great Britain of its agricultural possibilities, and in 1910 the premier, Sir Newton Moore, visited London to organize more effective propaganda. But experience proved that the adult migrant class in Great Britain was as a rule city-bred; moreover Australian farms rarely provide housing accommodation for a labourer's family, and this discouraged some who would otherwise have been prepared to go up-country.

In the circumstances zealous advocates of immigration (especially the British Immigration League) began to investigate the possibilities of juvenile migration. Before the war most of the States received a few boys for agricultural work, and either placed them with farmers or gave them a short preliminary training on government farms. In 1912 a first batch of boys was sent to New South Wales under the provisions of a private trust. A sum had been raised by public subscription for the

purchase of a battleship, but when the Commonwealth decided to build an Australian navy, half of the sum which had been collected was diverted to establish a 'Dreadnought' fund for the introduction of British boys between 14 and 18, and for their training on Scheyville farm at Pitt Town (near Windsor in New South Wales) in the elements of Australian agriculture. The 'Dreadnought' boys were of a better type than the average farm-labourer, and it was hoped that after a few years' experience they would take up land on their own account. The Western Australian government gave assistance to the Child Emigration Society of Oxford (founded by Kingsley Fairbridge), which sent out very young children and maintained them in a country establishment in Western Australia until they were old enough to go to work; and Henry Freeman took boys from the English ragged school union to a receiving-farm in Western Australia, from which they were drafted to private agricultural employment. In 1910 a special commissioner from the Barnardo homes investigated the possibility of placing children in Australia under the conditions that obtained in Canada; he reported that the children would not be properly cared for unless a large local staff of Barnardo inspectors was maintained—and the project was dropped for the time.

Speaking generally, the States recruited migrants through agents in the employ of shipping companies, who were paid a capitation fee for approved applicants; a few were also secured through philanthropic agencies. Assistance was given by direct contributions to the cost of passage, and by arrangements with shipping companies for reduced fares. There was marked competition between the States, and in 1912 at a premiers' conference it was decided to fix a minimum rate of passage-money and a maximum bonus for agents. In 1913 Victoria and New South Wales amalgamated their migration machinery in Great Britain. The majority of assisted migrants were British, though occasionally applicants from Europe were accepted —e.g. Western Australia found men from the north of Europe specially adapted for the heavy work of clearing land. Arrangements were made by the States for the reception of assisted migrants but were never very satisfactory except in Western Australia, where domestics were well cared for. The total number of assisted immigrants during the period 1911-14 was:—

Year	N.S.W.	Vic.	Q.	S.A.	W.A.	Tas.	Total.
1911	9,922	6,772	12,396	665	9,562	...	39,317
1912	14,956	15,112	6,462	3,212	6,970	(a)	46,712
1913	9,860	12,146	4,757	2,759	7,708	215	37,445
1914	6,655	7,496	4,096	644	1,729	185	20,805

(a) Not available.

The total number admitted was:—

1911	... 139,020	of whom	124,061	were British.
1912	... 163,990	,,	146,602	,,
1913	... 140,251	,,	122,443	,,
1914	... 110,701	,,	93,136	,,

The net immigration (excess of arrivals over departures) to the six States and two Territories of the Commonwealth was:—

Year	N.S.W.	Vic.	Q.	S.A.	W.A.	Tas.	N.T	F.C.T.	Total.
1911–14	88,514	52,027	29,335	3,935	23,219	-7,547	775	188	190,446

In 1915 immigration was practically suspended, and was not resumed until 1920. In that year the prime minister and the State premiers agreed that the Commonwealth should become responsible for the selection of migrants required by the States, and should supervise and assist their transport and the transport of approved nominees; the States undertook to receive and place them. Early in 1921 the Commonwealth took over all migration machinery in Great Britain, abolished the system of *per capita* payment to agents—which had been subject to abuse—and appointed a number of medical referees throughout Great Britain to examine applicants. It also subsidized the New Settlers' League, organized in 1921 to give assistance to migrants on arrival. A further extension of the system of assisted immigration was made possible in 1922 by the co-operation of the British government.

In 1917 a Dominions royal commission, appointed in 1912 by the British government to enquire into the best means of developing the natural resources of the Dominions and intra-Imperial trade, issued a final report in which it pointed out that the development of Imperial resources was hampered by the unsatisfactory distribution of man-power; the successful organization of migration, in its opinion, 'lies at the root of the problem of Empire development and largely upon it depends the progress of the immense territories of the Dominions and the increase of power of the Empire as a whole.' It suggested that openings should be found overseas for ex-service men and women, and that an increasing emigration of women and juveniles would be beneficial; it also advised the establishment of a special department to take over the supervision of emigration. Accordingly at the end of 1918 the emigrants' information office was superseded by a new body, later known as the oversea settlement committee. This committee was at first mainly occupied with administering the British ex-service passage scheme, under which 82,196 persons were placed in the Dominions between April 1919 and December 1922, 34,753 coming to Australia. In 1921 the British government called a conference on migration which recommended financial co-operation between the British and Dominion governments in a comprehensive policy of redistributing population, especially in connection with land-settlement schemes. To emphasize the unity of the Empire it was agreed that the terms 'oversea settlement' and 'oversea settlers' should be used in connection with intra-Imperial migration. These recommendations were accepted by an Imperial conference in the following June-August, and in 1922 the British government passed an Empire settlement act which empowered it to co-operate with any Dominion government in any scheme mutually agreed upon. The contribution of the British government, which was in no case to exceed half the expenses of any such arrangement, was limited to £1,500,000 for the first year, and £3,000,000 for each subsequent year, exclusive of any sums received as repayment of advances. As soon as the act was passed, negotiations were entered into between the Commonwealth and British governments which resulted in an agreement that one-third of the cost of passage of an approved settler should be contributed jointly by the two governments; advances covering the rest of the

passage-money might also be made under certain conditions. The assistance granted has since been increased, so that between 1 May 1925 and 30 April 1926 children under 12 years have been carried free, juveniles between 12 and 19 years have been required to pay a sum varying between £5 10s. and £11, and others £16 10s.—with special concessions for married couples. Advances to cover these sums may also be made by the two governments jointly. The passage-agreement applies both to nominees and to selected settlers. The results have not been so great as was expected. The Commonwealth is only authorized to select settlers in numbers and classes requisitioned by the various States. Domestics are always in demand; agricultural labourers can usually be absorbed, and artisans are occasionally sent for; there is a small but steady inflow of juveniles.

In 1922 the South Australian government passed an act which empowered them to apprentice British youths to farmers under official supervision, and this example was followed by Queensland and New South Wales, but the experiment has since been terminated in South Australia and New South Wales. Boys are still being assisted to New South Wales under the provisions of the Dreadnought trust, and receive a preliminary training on a government farm before being placed in private employment. Recently a 'Big Brother' movement has been organized in Australia on a small scale, each 'big brother' undertaking to keep in touch with a 'little brother' brought out from England; a first batch of 'little brothers' arrived towards the end of 1925. Since 1923 Barnardo children have been arriving in small batches, and children are still being sent to the Kingsley Fairbridge home in Western Australia.

The nominee is in a more fortunate position on arrival than the selected settler, since he has friends to assist him during the difficult period of adjustment. To extend the benefits of nomination to persons in England who have no personal friends in Australia, local organizations have been officially invited to associate themselves with organizations in Great Britain to effect 'group nominations;' the Australian organization arranges for the reception, placement, and after-care of a limited number of nominees whose names are filled in at the British end. A number of the Churches have responded to the invitation, and some 'group nominees' have already arrived under the assisted-passage agreement.

It has been estimated by the Commonwealth statistician that Australia's average annual capacity for absorbing immigrants has, over a long period of years, been 5½ per 1000. This ratio might be increased if sufficient capital for development schemes were provided and markets found. As has been stated above, the British government was empowered by the Empire settlement act to co-operate financially with the Australian governments in schemes for closer settlement. Negotiations were at once entered into by Western Australia, which resulted in an agreement between the government of that State, the Commonwealth, and Great Britain; Western Australia undertook to place 6000 settlers with their families on farms of their own at an estimated cost (excluding passages) of £6,000,000; the Commonwealth government was to raise the necessary loans, and the British government agreed to contribute a sum equivalent to one-third of the interest on the loans for a period of five years. The Western Australian government had in March 1921 given effect to its closer-settlement policy in the heavily-timbered south-western district; areas were developed on a group basis, the original groups being composed of persons with previous experience in Australia. Under the new agreement it was proposed to continue the experiment with British settlers, and 1352 were introduced. In 1924 the experiment was suspended, and a royal commission was appointed to enquire into conditions in the group-settlement area. In the majority report it was estimated that the farms which the State undertook to provide for £1000 were costing between £1400 and £1650, a sum considerably in excess of their market value; the British settlers were inexperienced, and no attempt was made to try them out at agricultural work before selecting them for the groups. In justice to them, however, the minority report pointed out that British settlers had not shown a greater tendency to leave their holdings than had the original Australian groups, the failures being British 31 per cent, Australian 41 per cent.

Agreements on similar lines were negotiated with the Commonwealth and the British government by Victoria and New South Wales, but were carried out on a much smaller scale than in Western Australia, and the migrants were not settled in groups. As a result of these experiments, and in view of the unsatisfied land-hunger of Australian citizens, a new agreement was made in April 1925 between the Commonwealth and British governments, whereby loan-money will be made available to the State governments at a low rate of interest to enable them to open up settlement areas and increase the carrying capacity of areas already settled; the maximum amount of loan-money provided for in the agreement is £34,000,000, to extend over a period of ten years; for every £75 made available to any State one British migrant is to be absorbed, not necessarily on the land. Western Australia (which is again taking families for closer settlement), Victoria, and South Australia have accepted these conditions; negotiations are still proceeding with the other States. The total number of assisted immigrants during the period 1921-5 was:—

Year	N.S.W.	Vic.	Q.	S.A.	W.A.	Tas.	Total.
1921	4,980	3,987	1,147	572	3,381	615	14,682
1922	7,087	9,145	1,711	1,531	4,373	411	24,258
1923	5,005	9,504	2,377	1,711	7,654	394	26,645
1924	6,211	8,721	1,788	1,375	6,715	226	25,036
1925	3,788	3,589	2,318	1,292	3,701	139	24,827

The total net immigration during the period was:—

Year	N.S.W.	Vic.	Q.	S.A.	W.A.	Tas.	N.T.	F.C.T.	Total.
1921	1,584	3,351	4,420	4,413	65	2,006	–254	69	15,654
1922	9,012	18,406	7,224	3,390	2,929	–3,212	–193	467	38,023
1923	3,492	16,497	10,789	4,823	5,283	–3,370	–30	56	37,540
1924	12,135	12,078	11,345	7,036	5,271	–4,495	29	350	43,749
1925	10,199	6,837	13,553	6,649	3,189	–4,029	56	903	37,357

The minus sign indicates an excess of departures over arrivals.)

See Sir T. Coghlan's *Labour and Industry in Australia* (1918); *Australia, its Land, Conditions and Prospects*, the report of the Scottish Agricultural Commission (1911); *Minutes of Evi-*

dence, Part 1, Migration (1912) and the *Final Report* of the Dominions Royal Commission (1917); the annual *Reports* of the Oversea Settlement Committee since 1919; and the Western Australian *Report of the Royal Commission on Group Settlement* (1925). For the early years consult R. C. Mills's *Colonization of Australia, 1829-42*; and for the Western Australian railway schemes, P. Mennell's *Coming Colony* (1892).

Mikluho-Maklay, NIKOLAI NICOLAEVITCH (1846-1888), descendant of an old Cossack family, was born on his father's estate in the Ukraine in 1846 (some authorities say 1847). He commenced his studies at the university of St. Petersburg, but the rigours of the climate compelled him to leave Russia and work first at Heidelberg (where he studied law), then at Jena and Leipzig, where he studied various natural sciences, settling down in the end to comparative anatomy. In 1866 he joined Professor Ernst Haeckel in a visit to Madeira, the Canaries, and Morocco; in 1869 he travelled through the Red Sea, visited Asia Minor, and joined Dr. Dohrn at Messina in zoological researches which eventually led to the founding of a biological station at Naples. In 1871 he embarked in the Russian cruiser *Vitiaz* for a tour of the South American coasts and Pacific Ocean, was landed at Astrolabe Bay in New Guinea near Port Constantine—which he named after a Russian grand duke—and lived there among the native tribes for 15 months, establishing the most friendly relations with them. Rarely has a more daring adventure been undertaken in the cause of science. 'The happy effrontery of his unannounced visit' says Leonard Huxley, 'took their breath away. . . . He let them infer that he was invulnerable,' and showed no concern when spears were flung within six inches of his head or when a native offered to run him through. Believing that he had been killed, the Russian government towards the end of 1872 sent a warship to search for documents which he might have left behind, but it found him reluctant to leave. For reasons of health, however, he decided to return to civilization; but in December 1873 he started again for New Guinea, on this occasion settling for a few months at Koviai near Triton Bay and devoting great attention to the slave-trade that was going on in those regions—he made a report upon it to the Dutch government, and reforms were instituted. In November 1874 he began a year's sojourn in the Malay Peninsula; in January 1876 embarked in a trading schooner and visited Yap, the Pelews, and the Admiralty and other groups off the New Guinea coast; then revisited his friends on the mainland and was welcomed with great joy. This coast, from Astrolabe Bay eastwards, was already known as 'the Maclay Coast,' and Englishmen (e.g. Romilly) who landed there later found that a claim to be 'Maklay's brother' was a sure passport to safety and friendship. In November 1877 Maklay returned to Singapore, and in July 1878 visited Sydney as the guest of William Macleay (q.v.); on 26 August of that year he delivered an address before the local Linnean Society urging the establishment of a biological station on Port Jackson—a reminiscence of his work at Messina. But he could not settle down, and in March 1879 was off again on a tour of the Melanesian groups, interesting himself especially in the labour traffic between the islands and Fiji and Queensland. In April 1880 he was investigating the islands of Torres Straits; in May he went to Brisbane to collate and consider his results, and made an expedition to the Balonne River; at the end of the year he returned to Sydney, renewed his agitation for a biological station, procured a grant of land for it at Watson's Bay, and revisited New Guinea in H.M.S. *Wolverine*, to whose commander he made a report on the evils of the labour traffic. Then, taking advantage of the visit to Melbourne of a Russian squadron, he returned to Russia and was welcomed with honour, the Tsar undertaking the cost of publishing an account of his travels. In 1883 he paid another visit to Sydney and married a daughter of Sir John Robertson. About this time the question of annexing eastern New Guinea became urgent, and, when after much confusion and long delays the British government allowed Germany to take the northern coast down to 8° S. lat., Maklay grieved exceedingly over the loss of his friends, and besought both the British and the German governments for specially considerate treatment of tribes so much attached to him—who were, further, of a stock distinct from the mass of Papuans and more amenable to kindliness. He left Sydney finally in 1886, and died in 1888. The house erected for his biological station, which he for some time used as a residence and a storehouse for his valuable collections, was in the end taken over by the department of defence; the compensatory payment became the nucleus of a research fund now administered by the university.

His name, given correctly above, is often transformed to 'Nicholas de Miklouho Maclay,' which is the form used on the passport given him when he left Russia as a student, and which was consequently used by most European scientific bodies.

Military Defence. *Early Days.*—Until 1870 the defence of the Australian colonies by land was entrusted primarily to detachments of Imperial troops. Under Governor Phillip the settlement was policed by a detachment of marines, who in 1791-2 were replaced by a regiment, the New South Wales Corps (q.v.), specially raised for service in Australia. In 1800 Governor Hunter had reason to suspect that some Irish 'exiles' who had recently arrived were planning a revolt, and to strengthen the colony's armed forces he raised two bodies of 50 volunteers each at Sydney and Parramatta, styling them 'The Loyal and Associated Corps;' in July 1801, however, Governor King disbanded them because of a difficulty in finding officers. In 1803, on receipt of the news of a fresh outbreak of war between Britain and France, the volunteers were reinstated as 'Loyal Associations,' were armed, clothed, and victualled at the government's expense, and rendered good service in helping to put down the rising at Castle Hill in 1804. When Macquarie at the end of 1809 brought out his own regiment, the 73rd, the volunteers were again disbanded, the New South Wales Corps was sent back to England, and for the next 60 years the garrison was composed of British regiments, Sydney taking its place on the roster of garrison-stations of the Empire. The New South Wales Corps had been engaged mainly in police work, and this was for many years reckoned the chief, if not the only, duty of the British garrison. The list of regiments which so served in Australia, with the

dates of arrival of their first detachments and departure of their last, is given below.

During the wars with France (1793-1815) measures were occasionally taken to protect the settlement from attack, but these were only spasmodic efforts. The first fortification was started in July 1788 when Lieutenant William Dawes (q.v.) was ordered to construct a redoubt on the eastern side of the Cove. It was finished in November, a flagstaff was erected, and two pieces of ordnance were placed in position on New Year's Day of 1789. In 1791 fortifications were constructed by Dawes on the western side of the Cove, and a corporal's guard was mounted daily in a building which had been used by Dawes as an observatory; hence the point, though named by him Point Maskelyne, has become known as Dawes Point. Phillip in 1791 installed the Dawes Point battery; Hunter in 1798 installed that on Bennelong Point, and mounted a few guns on Garden Island; King, always expectant of French attacks, in 1801 placed a third battery on George's Head, and in 1804 began the construction of a 'citadel' on Windmill Hill (where the Sydney observatory now stands), from which both the seaward approaches to the Cove and the inland reaches of the Parramatta River could be commanded. This fort, which he named Fort Phillip, was a hexagon mounting four guns on each face. His enthusiasm lasted for two years, and then the building gangs were called away to other work. In 1807 Meehan's map shows the fort as 'irregularly begun, but now rebuilding,' but the last phrase was optimistic. Macquarie during his 11 years' rule strengthened the battery at Dawes Point, constructed a stone fort (afterwards known as Fort Macquarie) on Bennelong Point, and gave Fort Phillip a powder-magazine; his wish to build a bigger citadel at the fort-site, with the Dawes Point battery as an outwork, was thwarted by Bigge's desire to put a new gaol there. Bigge recommended the erection of a battery at South Head. The need, however, of retrenchment in expenditure and the widespread feeling that no nation would dare to attack a British settlement led to neglect of the forts, and in 1827 the colony's defences consisted only of the Dawes Point battery (then in bad repair) and Fort Macquarie. Darling protested in 1827 and again in 1828 that Sydney was 'totally destitute of every military defence,' and asked for an engineer officer to report on the situation, but he was repeatedly snubbed by the colonial office, and forbidden to begin any new work until it had been specifically approved by the British authorities. In 1833 Bourke asked the war office for an engineer officer, adding that the field-guns in store lacked both carriages to mount and men to work them, and the government in 1835 despatched George Barney (q.v.) to Sydney and another engineer officer to Hobart; the work was evidently expected to be light, for Bourke was ordered to use Barney as civil engineer also.

At Hobart Macquarie constructed a 9-gun battery, which he called Fort Mulgrave, on the southern point of Sullivan's Cove, and Arthur contemplated the construction of another on the northern point, where Sorell had reserved a site. But the authorities in London were more concerned about economy than about defences, and in 1827 Arthur had to report that out of £13,500 spent on defence in the previous ten years only £207 had been spent on Fort Mulgrave, and nothing at all on the proposed battery.

In spite of the governors' appeals little attention was paid by the British authorities to Australian defence until late in the forties; it was difficult to procure the necessary troops to garrison Western Australia, South Australia, Melville Island, and Port Essington; instructions from London bade them detach two companies here and another there until the garrison in New South Wales was almost depleted. In 1839 Barney recommended the construction of batteries on Bradley's Head and the little island known as 'Pinchgut' (q.v.), and asked for £5000 to spend on the defence of Sydney, Newcastle, Wollongong, Port Macquarie, and Port Phillip; but even this modest request was refused. In 1840, however, he levelled the sites for the two Sydney batteries, Gipps having become so desperate that he ordered him to begin work, with the full knowledge that both of them were committing a grave breach of discipline. As the work was done by convicts and so cost only £300, the expenditure was sanctioned, but Gipps was forbidden to go on.

In November 1846 Earl Grey peremptorily ordered FitzRoy to send at least 900 men to New Zealand, where order was being slowly restored among the Maori tribes; the gap in New South Wales, wrote Grey, could easily be filled by the enlistment of local police or militia. In October 1847 he warned FitzRoy that, as the convict establishment in New South Wales was to be broken up, the British garrison would soon be greatly reduced. FitzRoy had already (in August 1847) forwarded to the colonial office an appeal from the New South Wales legislature for aid in strengthening the defences of Sydney, which were hopelessly inadequate and out of repair—in 1839 two United States cruisers under Commander Wilkes had entered Port Jackson and anchored off Circular Quay at night-time, their arrival remaining unknown till daylight. But Grey was obdurate. Sydney must take care of itself, he wrote; if forts were needed, the colony must pay for them, though Britain would willingly lend engineers to design them; if an artillery force was desired, Sydney and Melbourne could easily create one, 'composed of the labouring population of these towns, and officered by the inhabitants of higher station.' In November 1849 Grey announced that all barracks and military buildings would be handed over to the colonial authorities, that all military expenses other than the pay of the troops must be borne by the colonies, and that the garrison would be reduced to a guard in Sydney and another in Melbourne. If the colonies wanted more troops, they could pay for them; if the barracks, etc., were not properly kept up, all troops would be withdrawn. In June 1850 he offered an additional regiment and a detachment of sappers and miners, provided that the colony paid all expenses save transport.

In November 1851 the legislative council refused to contribute towards defence (even towards that of Port Jackson) until it was given control of the colony's revenues. The gold-rush of 1851 and a change of ministry in Britain postponed the bickering until October 1853, when the legislative council—having been assured that it would shortly acquire full control of all revenues—sanctioned the erection of forts on South and Middle heads. This activity was greatly stimulated by the outbreak of the Crimean war, and a volunteer force (to be described later) was authorized in August 1854. The situation arising out of this war led to a reorganization

of the imperial forces in Australia, the headquarters being moved from Sydney to Melbourne —which from the British point of view was the most central point and had the advantage of receiving its mails more quickly from London. Until 1854 no serious attempt was made to put Melbourne in a state of defence despite its rapidly increasing importance; but early in that year the Victorian government agreed to meet practically all expenses of the imperial forces (about 700 troops of all arms). About the same time a report was received from Captain Ross, R.E. (who had been ordered to draw up plans for harbour defences), recommending that two steam guardships should be stationed in the port, and 2000 troops of the line, with a company of engineers and another of artillery, in the colony; he was opposed to fortifying the Port Phillip heads. In August 1854 Sir R. Nickle (q.v.) with the headquarters staff reached Melbourne, and there followed a short period of active preparation for defence. Work was begun on extensive military barracks in the St. Kilda-road, and on the Williamstown and Sandridge batteries, but enthusiasm soon waned. In 1858 a new agreement came into force, whereby the colony provided barrack accommodation and colonial pay and allowances for imperial troops, imperial pay and allowances being paid by the British government; a similar agreement was made by the other Australian colonies, and there was no further change in the conditions until 1863. For some time departmental and parliamentary committees in London had been protesting against the maintenance of colonial garrisons which cost the mother-country nearly four millions per annum, whereas the colonies paid only £380,000 (these figures refer to all British colonies, not to Australia alone). Nothing, however, was done until in March 1862 the house of commons resolved that colonies under responsible government ought to bear the whole expense of their internal defence, and to assist in their external defence as well. Acting on this resolution, the British government in 1863 notified the governments of the Australian colonies that for the future naval protection must be considered to exhaust British responsibility. For land defence Britain was willing to lend Australia 15 companies of infantry (see the following table), to be paid for at the rate of £40 per man per year; if more were wanted, or if artillery were preferred, the rate for the extras would be £70. Further, no guarantee could be given that the troops would not be withdrawn in an emergency.

Colony.	Number of companies.	Number of officers.	Number of men.	Officers and men.	Annual payment by colony.
					£
New South Wales.	4	19	340	359	14,360
Queensland	1	3	88	91	3,640
Victoria ...	5	22	423	445	17,800
Tasmania	3	11	249	260	10,400
South Australia.	2	6	166	172	6,880
	15	61	1,266	1,327	53,080

In 1866 Victoria asked for artillery instead of infantry, but the request was refused. In 1869 the Victorian premier, James McCulloch, notified the colonial office, through the governor, that Victoria would vote no more subsidies for British garrisons, unless (*a*) artillery were substituted for infantry, and (*b*) a guarantee were given that the artillery contingent would remain in war-time. The colonial office replied that in all probability all troops would be withdrawn from Australia in the near future, but no definite decision would be made until the views of other colonial premiers had been ascertained. At the intercolonial conference of 1870 it was agreed that the conditions laid down for the maintenance of British troops in Australia were not acceptable, and that the colonies would have to rely on their own resources for military protection; on the other hand, the naval defence of the Australian coast-line and of the commerce in its ports was a matter primarily for the Imperial government. The British troops were thereupon withdrawn. The following table exhibits a list of the various regiments which have served in Australia:—

Regiment.	Year of arrival.	Year of departure.
73rd (Highlanders)	1810	1814
46th (South Devon)	1814	1818
48th (Northamptonshire)	1817	1824
3rd (Buffs)	1823	1827
40th (2nd Somersetshire)	1824	1829
57th (West Middlesex)	1825	1832
39th (Dorsetshire)	1827	1832
63rd (West Suffolk)	1829	1833
17th (Leicestershire)	1830	1836
4th (The King's Own)	1832	1837
50th (West Kent)	1833	1841
21st (Royal North British Fusiliers)	1833	1839
28th (North Gloucestershire)	1835	1842
80th (Staffordshire Volunteers)	1837	1844
51st (2nd Yorkshire West Riding Light Infantry).	1838	1846
96th	1841	1848
99th (Lanarkshire)	1842	1856
58th (Rutlandshire)	1844	1847
11th (North Devonshire)	1845	1857
65th (2nd Yorkshire North Riding)	1846	1849
40th (2nd Somersetshire)	1852	1860
12th (East Suffolk)	1854	1861
77th (East Middlesex)	1857	1858
50th (West Kent)	1866	1869
14th (Buckinghamshire)	1867	1870
18th (Royal Irish)	1870	1870

Some of the regiments in this table were represented by detachments only. The 28th was due to leave New South Wales in 1843, but Gipps, having received in May 1842 the news of the disasters in Afghanistan, despatched the regiment to India during June, and was thanked by the British government for so doing.

Locally Raised Forces.—With the inception of locally raised forces begins the history of six separate movements which were not co-ordinated until the Commonwealth came into being.

After the disbandment of the Loyal Associations in 1810 no further effort to raise defence forces locally was made until 1854, when the Crimean war stimulated *New South Wales* into raising a rifle regiment, a troop of yeomanry, and a battery of artillery. The regiment —about 330 men in six companies, known as the 1st Sydney battalion of rifle volunteers— is considered to be the infant form of what is now the 1st battalion, Commonwealth military forces; the yeomanry mustered only 28 troopers in 1855, and in 1856 had disappeared. In 1859 rumours of war in New Zealand and of French designs against England revived volunteering, and in 1860 a much larger force—14 companies of rifles in Sydney, six in the country districts, one troop of mounted rifles, two batteries of artillery in Sydney and one at Newcastle—was raised and equipped; by January 1861 nearly

1700 men had been enrolled. The mounted troops were disbanded in 1862, and the rest of the force steadily dwindled until October 1867, when interest was revived by the passing of an act granting 50 acres of land to every volunteer who should complete five years' continuous and efficient service. In 1868 a Scottish regiment —the Duke of Edinburgh's Highlanders—was raised, and in 1869 a corps of engineers; in 1870, when the British garrison was withdrawn, a paid force was raised—a battery of artillery and two companies of infantry—but the infantry was disbanded in 1872. For some years the battery was the only regular force New South Wales possessed, and in 1876-7 additional batteries were raised. Meanwhile the land-grant system had proved unsatisfactory, as the grantees in many cases sold their orders to the highest bidder; in 1874 the system was abolished, and recruiting markedly declined. The Scottish regiment disappeared in 1878.

It is convenient to insert here a further instalment of the story of New South Wales fortifications. In 1854 Port Jackson was being gradually protected by a scheme involving batteries on Dawes Point, Pinchgut, Bradley's Head, George's Head, Middle Head, and South Head, George's Head being the principal fort. But in 1855 the new governor—Sir William Denison, a captain of engineers who had learned his engineering 30 years before—persuaded the legislative council to dismantle all the outside forts and revive the long-since discarded scheme of defending the inner port alone. Pinchgut—henceforth to be called Fort Denison—was the central point of his scheme, supported by batteries at Dawes and Kirribilli points and Mrs. Macquarie's Chair, and by a renovated Fort Macquarie. Over £60,000 was spent on this absurd scheme, which was abandoned during the sixties, when the scheme of 1854 was readopted. By 1872 the forts at Bradley's, George's, Middle, and South heads had been constructed and armed with guns ranging from 68-pounders to 18-ton muzzle-loading rifled cannon.

In *Victoria* the alarm caused by the Crimean war produced in 1854 the Melbourne volunteer rifle regiment, with an establishment of 2000 men, the Victorian volunteer yeomanry corps, and the Geelong volunteer rifle corps. But, as in New South Wales, the excitement waned, and by 1858 the total strength had dwindled to about 800 men. In July 1859 rumours of a probable European war reached Melbourne, and volunteering was revived; but not till 1860, when the British garrison was withdrawn for service in New Zealand, was there any enthusiasm. Ten companies of rifles were formed of volunteers drawn from Melbourne (proper), North Melbourne, Collingwood, Richmond, Prahran and South Yarra, St. Kilda, Emerald Hill, Hawthorn and Kew, Pentridge, Williamstown. A company of artillery was also raised from the seaport towns of Portland, Belfast, and Warrnambool. The Richmond company evolved into the Yarra Borderers (now the 22nd battalion, Commonwealth military forces), and two others—North Melbourne and Melbourne—were the nucleus of the 51st regiment, Commonwealth military forces. In 1863 the volunteer force was reorganized under a scheme providing for 13 rifle companies, seven artillery companies, an engineer corps, and a 2-companied naval brigade; by the end of the year over 3600 men were enlisted in these companies. In 1865 the laws relating to volunteering were consolidated, a land-grant scheme like that of New South Wales being adopted. In 1870, when the last British troops left Victoria, a permanent paid artillery corps (later the Victorian permanent artillery) of about 120 men was raised, and by 1872 the Victorian defence forces totalled nearly 4000.

Meanwhile the authorities responsible for Victorian defence had decided that the only form of attack likely to be made on the colony must be a raid on Melbourne, which could be best guarded against by blocking the passage through the heads of Port Phillip. More and more stress was laid on artillery, and in 1875 it was decided that 2000 out of 3400 men should be artillerymen. Forts commanding the heads were constructed near Queenscliff.

In *South Australia* also an impulse towards volunteering was given by the Crimean war, and steps were taken to raise 2000 men; on 24 May 1855 a troop of mounted rifles, two battalions of infantry, and two companies of artillery were reviewed. As in the other colonies, enthusiasm languished when the war was over, but revived in 1860, when about 600 men rejoined the ranks. The 1st Adelaide rifles, then constituted, have become the 10th battalion, C.M.F. In November 1862 the South Australian defence forces numbered 2008 of all ranks. The force of 1854-5 had been partly paid, but that of 1860-6 was on a volunteer basis: in 1866 it was disbanded, and a partly paid force of about 800 men was substituted, the pay being 5s. per day of actual service. In 1867 the rate of pay for the artillery was increased, and authority was given to raise mounted troops. At this date the volunteer troops in South Australia consisted of one battery of field artillery at Adelaide and one cavalry squadron of four troops, which were designated No. 1, Mylong troop; No. 2, Strathalbyn troop; No. 3, Adelaide troop; No. 4, Reedbeds troop. The infantry consisted of the South Australian (Prince Alfred's Own) volunteers. No. 1, No. 2, and No. 4 companies were raised in Adelaide, No. 3 in Kapunda, No. 5 at Gawler, and No. 6 at North Adelaide.

In the other Australian colonies the raising of local forces proceeded on similar lines, but on a smaller scale. *Queensland* in 1860 formed a troop of mounted rifles, and within a few years added infantry and artillery. In 1862 the strength of the troops amounted to:—

Brisbane light horse	10
Ipswich light horse	15
No. 1 battery artillery, Brisbane ..	34
Maryborough rifles	3
No. 1 company, Brisbane rifles ..	43
No. 2 company, Ipswich rifles	49
Rockhampton rifles	94
	248

The Brisbane light horse and the Maryborough rifles ceased to exist in 1863. In 1876 the total strength was only 415.

In *Tasmania* the first local force was raised in the year 1859 and consisted of Hobart Town artillery, Launceston artillery, 1st rifles (Hobart), 2nd rifles (Hobart), 3rd rifles (Hobart), Buckingham rifles (Newtown), City guards (Hobart), Kingsborough rifles (Kingston), Derwent rifles (New Norfolk), Launceston rifles, Longford rifles, Huon rifles (Franklin), Westbury rifles, and Deloraine rifles. A mounted corps was raised in Launceston in 1860; it consisted of about 43 of all ranks under the command of Cornet Barnes. On 1 October 1861

the total strength of the troops in Tasmania was 72 officers and 1120 other ranks. In 1867 the Victorian example led to the creation of a third battery, the infantry being disbanded. In 1870 the vote was dropped from the budget, and the colony remained without a defence force until 1878.

In *Western Australia* the volunteer forces were organized by the officers of the 12th regiment of foot (which was stationed in the colony in 1858) and consisted of Perth horse artillery, Pinjarrah mounted rifles, Wellington mounted rifles, Perth metropolitan volunteers, Fremantle rifle volunteers, and Geraldton rifle volunteers. This force consisted of about 700; each volunteer enrolled was entitled to a grant of 50 acres after five years service. Little interest was taken in the movement, and a 'Pensioner Force' was formed from a number of pensioners who were afterwards employed on various military duties; but the colony did not obtain responsible government until 1890, and was therefore not considered responsible for its own defence.

The Jervois-Scratchley Reports.—In 1876 the colonial governments began to take stock of their defences, and were much dissatisfied. They asked the British government for advice, and early in 1877 Sir William Jervois (q.v.), then governor of the Straits Settlements, and Major Peter Scratchley (q.v.), who had in 1860-3 designed the first defences of Hobson's Bay, were commissioned to advise on a correlated scheme of seaport defence. In 1878 Jervois was appointed governor of South Australia—a comparatively leisured post—in order to give him freedom for travel, and Scratchley was made commissioner of defences for all the colonies except Western Australia. From 1877 to 1883 the two advisers worked at their reports, basing particular recommendations on the general principle that attack should be met (*a*) by armed vessels operating in the open sea, (*b*) by battery and torpedo defences, worked from powerful armoured forts with the heaviest guns available, (*c*) by a well-trained field force, consisting largely of volunteers but with a nucleus of permanent paid men. The volunteers, too, ought to be partly paid, since their training in camp and otherwise would thus be ensured.

The general result of this investigation was the gradual reorganization of all the colonial forces on a single plan, with variations depending on the population and revenues of the various colonies. A small force of 'permanent' soldiers was allotted to man the fortifications and carry on staff work. The bulk of the troops was organized as 'partially paid' militia; the report recommended that:—

> The officer commanding the force may order such parades as he may consider necessary, provided that no part of the cavalry or infantry shall be called out for more than thirty-six whole or seventy-two half-days in one year, nor the artillery more than forty-eight whole or ninety-six half-days in a year, and the reserve not more than twelve times in one year.

Among them would be bodies of field artillery, engineers, and torpedo experts, the latter all engineers or skilled electricians in private life. Unpaid volunteers Scratchley considered unsatisfactory because effective training could not be enforced on them; he strongly recommended the formation of reserves, to consist of men who had served for three years in the militia and were willing to undergo a certain amount of training for another five years. In 1884, at the beginning of this development, the colonial troops were classified as follows:—

Colony.	Infantry.	Artillery.	Engineers.	Torpedo force.	Mounted force.	Total.
New South Wales—						
Permanent ...	...	319	...	...	...	319
Militia	1,340	300	60	100	...	1,800
Victoria—						
Permanent ...	...	125	...	...	...	125
Volunteer.....	2,191	1,016	250	18	125	3,600
South Australia—						
Permanent ...	...	50	...	...	...	50
Militia	780	150	...	...	...	930
Volunteer.....	900	...	...	...	...	900
Queensland—						
Volunteer.....	755	250	60 (including torpedo force.)			1,065
Tasmania—						
Volunteer.....	414	200	...	...	20	634
Total	6,380	2,410	370	118	145	9,423

In March 1901, when the forces of the six colonies were consolidated under the Commonwealth, their strength was as follows:—

State.	Permanent.	Militia.	Volunteer	Total.
New South Wales	669	5,549	3,493	9,711
Victoria	443	3,554	2,602	6,599
Queensland	301	4,053	654	5,008
South Australia	51	2,949	.....	3,000
Western Australia.	50	.....	2,235	2,285
Tasmania	30	.....	2,377	2,407
Total ...	1,544	16,105	11,361	29,010

The permanent forces included chiefly the administrative staff and garrison artillery; in the larger States the volunteers were almost entirely infantry, engineers and field-artillery being supplied by the militia, which also accounted for a large part of the infantry and most of the mounted forces.

This improvement both in organization and in numbers (from 9423 in 1884 to 29,010 in 1901) was mainly due to the Jervois-Scratchley reports, but in the interval two other influences had been at work. In 1885 expectations of war with Russia—the same which put a hasty end to the Sudan campaign (q.v.) of that year—gave a fresh impetus to volunteering. In *New South Wales* a light horse regiment (afterwards known as the New South Wales lancers) and the Scottish rifles were the firstfruits of this enthusiasm; by 1893 the lancers and several smaller volunteer bodies had been absorbed into the militia, but the Scottish regiment persisted, and in 1895—thanks to the support of General Hutton (q.v.)—was joined by Irish rifles and St. George's rifles. In 1897, under General G. A. French (q.v.), the volunteer strength nearly quadrupled, the Australian horse, Australian rifles, Railways corps, and National guard were formed, and the existing regiments greatly increased their strength. In 1898-9 the Scottish rifles established companies in Newcastle, Maclean, and Lismore on the north coast; and by the end of 1900, when the stimulus of the South African war (q.v.) had had time to act, the four rifle regiments averaged over 660 men each and smaller bodies were in process of formation. In *Victoria* the course of events contrasted curiously with that just narrated.

During 1884 the volunteer forces were entirely replaced by militia, rifle clubs being established to absorb such volunteer enthusiasm as could not find time for regular training. In 1885 the country districts formed a regiment of mounted rifles, to whom small payments were made, and in 1888 an infantry regiment, the Victorian rangers, was raised under similar conditions in the same areas. In 1897 a Scottish regiment, purely volunteer, made its appearance. *Queensland* in 1885 followed the example of New South Wales and raised a Scottish volunteer regiment (which disbanded in a few years); otherwise the development of the Queensland forces proceeded along the Jervois-Scratchley lines, as did that of *South Australia*, though there volunteering was still encouraged. *Tasmania* remained dependent on its volunteers, who in 1898 were organized in a single 3-battalioned infantry regiment.

Under the federal constitution a Commonwealth ministry of defence in 1901 took control of all the State forces. The task of welding them into a homogeneous army was entrusted to Sir Edward Hutton, who in 1901-4 laid the foundations on which all subsequent organization was based. The defence acts of 1903-4—which, with the regulations made under them, still constitute the legislative basis of the Australian military system—empowered the governor-general to arrange for the defence of the Commonwealth, to appoint and promote officers, and to determine military districts and sub-districts. In time of peace enlistment was voluntary, but in time of war the governor-general might call out all males between the ages of 18 and 60 for service within the Commonwealth. The Imperial army act was declared to apply to Commonwealth forces on active service, except in so far as its provisions were inconsistent with the defence acts. The military system included permanent troops and citizen forces (militia and volunteers), with a reserve consisting of officers who had retired from active service and members of rifle clubs duly enrolled. A 'Royal Australian Garrison Artillery Regiment' provided garrisons for the principal forts, with a militia garrison artillery as relief for certain strategic positions and defended ports. Arrangements were made for the maintenance of cadet corps. The militia was given a standard of efficiency, inefficients being discharged. The Commonwealth was divided into military districts roughly corresponding to the six States; and provision was made for the building and equipment of forts, the institution of arms and ammunition factories, and the control of railways and tramways when needed for the transport of troops on active service. In 1905 a council of defence to determine questions of policy, and a military board to supervise administration, were duly constituted.

Though federation had distinctly improved the military defence of Australia, the voluntary system which obtained in peace-time seemed to many public men inadequate for defence in an emergency. In September 1905, therefore, an Australian National Defence League was formed, with the object of securing universal compulsory training (military or naval), on Swiss lines, of the boyhood and manhood of Australia. During the defence debates of 1902 William Morris Hughes had tabled a motion in favour of compulsory military training for adults, but it had been rejected; thereafter the matter was frequently discussed in parliament; but no definite action was taken until in December 1907 Alfred Deakin (then prime minister) on his return from an Imperial conference made his policy speech on defence. He accepted the principle of compulsory training, limiting it for the time being to males in their 19th, 20th, and 21st years; later, he proposed to extend it in some form to lads of from 12 to 18 and to adults between 21 and 26. The training immediately proposed was a continuous training of 18 days in the first year, 18 in the second, and 12 in the third, trainees with satisfactory cadet experience being allowed shorter terms. As a rule no payment was to be made. A military college was to be opened for the training of officers and a cordite factory established. In September 1908 a defence bill embodying the general substance of this policy was introduced; before it became law, however, the Labour party was in power—and the Labour policy, as explained by the prime minister in March 1909, was more strenuous. It included compulsory training for lads between 12 and 18—day or half-day drills, or school instruction; compulsory training for adults of 18-20 years, in the form of a continuous camp for two or three weeks each year; and a voluntary annual camp for adults of 21-30. Time spent in camp was to be paid for. But the Fisher ministry was out of office before the bill had been prepared, and Deakin on his return to power re-introduced the defence bill of 1908 in a modified form. Compulsory training was to be effected by division into junior (12-14) and senior (14-18) cadets, and citizen forces (18-20). The volunteer system was to be terminated, but the militia maintained and recruited up to war-strength from the trainees on the completion of their service. Trainees who did not join the militia would pass into the reserves until their 26th year, and would be obliged to register in their residential districts annually. Days spent in camp were to be paid for. Provision was made for a military college and a school of musketry. This bill was passed, but before it came into operation Lord Kitchener, at the invitation of the Commonwealth government, visited Australia to report on the military forces, forts, and other defence works. His report, issued early in 1910, estimated the strength of the land forces necessary for Australia's safety at 80,000, one half to secure the larger cities and defended forts from attack and the other to operate as a mobile striking force. To raise this force within a reasonable time he advised the extension of compulsory training to the 25th year, the reserve to consist of trainees in their 26th year. In addition to continuous training in camp, instruction should be given at drills. The only way, said Kitchener, of organizing a satisfactory citizen force was to divide the Commonwealth into areas from which the military units would be drawn. Each area should provide a definite proportion of a fighting unit, and should be in charge of a thoroughly trained permanent instructional officer, assisted by one or two non-commissioned officers. Ten areas should form one group under the supervision of a superior instructional officer, who would become brigade-major in time of war. The extent of the 'area' must depend on the density of population. In the cities two, and in the country three, areas should be allowed per battalion of infantry. The area officer's duties would include the inspection of junior cadets, the organization and training of senior cadets, and all matters relating to the enrolment, equipment, organization, and training of the adult soldier. Kitchener

further recommended the formation of a staff corps drawn from the proposed military college.

An amending act was passed in 1910 which embodied Kitchener's recommendations. It defined the classes exempt from service—persons with religious objections, school-teachers qualified as naval or military instructors, members of parliament, magistrates, constables, hospital doctors, etc., all coming under the listed exemptions. The act was proclaimed on 1 January 1911, arrangements were at once made for the training of 200 non-commissioned officers for the instruction of the new army, and compulsory training commenced on 1 July. The training of junior cadets began on the first day of July in the year in which the person liable reached the age of 12 years and continued for two years, the annual training being 90 hours' drill; that of senior cadets began on the first day of July in the year in which the cadet reached the age of 14 years and continued for four years, the annual training being 4 whole-day drills (of 6 hours), 12 half-day drills (of 3 hours), and 24 night drills (of 1½ hours) or their equivalent. For the citizen forces the training was for seven years, comprising annually 16 whole-day drills, of which not less than 8 must be passed in a continuous camp. The Commonwealth was divided into 224 training areas, which constituted 92 battalion areas, 4 battalion areas being grouped into a brigade area. The members of the old militia army were permitted to complete the three years for which they had enlisted, and the militia system was then abandoned, only the officers and non-commissioned officers being allowed to re-engage in the citizen forces.

The Royal Military College at Duntroon, Federal Territory, was opened in June 1911. Admission to the college is by open competitive examination, a definite number of vacancies being allotted to each State on a population basis; the age for admission is between 16 and 19 years. The normal course lasts for four years and is followed by a turn of duty in England, India, Hong Kong, or Singapore, after which graduates are appointed to the permanent staff. No fees are charged for maintenance and instruction, and each staff-cadet receives an allowance for incidental expenses.

As recommended by Kitchener, a war railway council consisting of military and railway officers was instituted in 1911. Its chief duties are to furnish advice and information on railway transport for military purposes and to secure co-operation between the Commonwealth defence department and the States' railway departments in regard to the concentration and mobilization of troops.

Slight modifications in the defence acts were made during 1911 and 1912. On the outbreak of the European war in 1914, the Australian forces, though already showing much improvement in training and numbers, consisted chiefly of young men from 19 to 21, who were hardly suited to form the nucleus of an oversea contingent. Consequently the Australian Imperial Force (q.v.) was organized and maintained as an entity distinct from the citizen forces, whose liability was limited to home service. But when the war was over, it was decided to change the numbers of units and formations of the citizen forces to correspond with those of the A.I.F., in order to maintain traditions established at the front. The divisional organization which had evolved in the A.I.F. was, therefore, on 1 April 1921 applied to peace conditions with a minimum of permanent staff. In October 1916 a referendum was held on the proposal to empower the government to conscript citizens for military service outside the Commonwealth during the war, and was rejected. A second and greatly modified proposal was submitted in December of the following year but this also was rejected—indeed, by a much larger majority (see REFERENDA).

Following on the international conference held at Washington in 1921, the Australian government decided to restrict the operation of the compulsory training provisions of the defence acts to the more populous centres and to certain quotas, training being confined to cadets from 16-17 years of age and to citizen soldiers from 18-19 years. Junior cadet training ceased as an activity of the defence department on 30 June 1922. The existing divisional organization of the field force is being retained in skeleton form, the units being much below their war-strength. At the same time a number of the military and civil personnel of the department were retired. Meanwhile on 3 August 1921 the administration of the rifle clubs had been transferred from military to civil control.

The allotment of units to areas of the Commonwealth citizen forces at 1 February 1924 is shown in the following table:—

State.	Brigade Areas.	Battalion Areas.													Training Areas.
		Number of Areas.	Providing the undermentioned Units.												
			Infantry Battalions.	Light Horse Regiments.	Field Artillery Batteries.	Engineers.		Signallers.		A.A.S.C. Companies.	A.A.M.C.		A.A.V.C. Sections.		
						Companies.	Troops.	Sections.	Troops.		Field Ambulance.	Sanitary Section.			
New South Wales ...	5	21	21	7	17	7	3	18	4	10	8	3	4		35
Victoria	5	21	21	6	17	7	3	18	4	10	7	2	4		27
Queensland	2	8	8	4	7	2	1	9	1	3	3	1	1		10
South Australia	1	5	5	4	4	1	1	2	1	2	2	1	1		9
Western Australia ...	1	4	4	1	3	1	...	4	...	1	1	1	...		7
Tasmania	1	3	3	1	3	1	...	3	...	1	1	1	...		4
Total	15	62	62	23	51	19	8	54	10	27	22	9	10		92

Soon after taking control of the defence organizations in Australia the Commonwealth military authorities realized the necessity for a small-arms factory; enquiries were instituted in 1907 and a factory was erected at Lithgow. The establishment of factories for the manufacture of cordite, harness, saddlery, leather accoutrements and, later on, of cloth and acetate of lime, followed. Since the outbreak of the European war interest in the subject had been stimulated, and in 1919 A. E. Leighton prepared a comprehensive report on the production of munitions in Australia, his proposals being calculated to meet all the estimated peace require-

ments of an army of 300,000 men. As a result of the reduction in the defence estimates in 1921 and the curtailment of the universal training system this scheme was modified, provision being made only for nucleus factories with an output capacity sufficient to train the staff in the technique of manufacture and to act as educational institutions for commercial establishments should rapid expansion become necessary.

The total military expenditure for the Commonwealth, and the strength of her land forces, are shown in the following table:—

Year.	Expenditure.	Strength of land forces.
	£	
1901–02	780,260	28,886
1902–03	600,625	25,604
1903–04	615,673	22,404
1904–05	728,810	19,880
1905–06	718,329	20,499
1906–07	780,023	21,948
1907–08	824,539	21,911
1908–09	783,330	22,631
1909–10	1,205,666	23,361
1910–11	1,540,992	23,509
1911–12	2,447,382	24,199
1912–13	2,685,689	23,696
1913–14	2,765,199	34,537
1914–15	12,709,017	45,645
1915–16	37,489,087	60,972
1916–17	57,099,080	74,127
1917–18	66,307,728	88,362
1918–19	95,823,485	122,186
1919–20	68,067,578	109,881
1920–21	59,435,628	102,665
1921–22	46,025,539	127,960
1922–23	33,351,849	37,156
1923–24	32,922,571	38,603
1924–25	32,182,149	38,889

Miller, Sir Denison Samuel King (1860-1923), born near Wollongong in New South Wales on 8 March 1860 and educated at the Deniliquin public school where his father was headmaster, in 1876 entered the employ of the Bank of New South Wales and during 36 years' service rose to be chief metropolitan inspector. In 1912, the Commonwealth government being in need of a governor for its newly established Commonwealth Bank (q.v.), Denison Miller was recommended by Russell French (q.v.) for the position, and on 1 June of that year received the appointment. At that moment the bank had no capital, and its only assets were a loan of £10,000 from the government and the knowledge that the Commonwealth was at its back. By June 1914 its resources had risen to about 9¾ millions sterling; the enormous financial transactions of the Commonwealth during the war were carried out by it under Denison Miller's guidance, and in 1922 its assets amounted to 126½ millions. Entrusted with powers not given to any other individual since Australia attained responsible government, Miller never shirked responsibility; his work was incessant, his travels throughout Australia were wide and many, and his decisions (which were prompt, imaginative, and optimistic) of the highest importance to his country's welfare. When he died suddenly on 6 June 1923, the loss was deplored as whole-heartedly by those who had opposed the establishment of the bank as by its strongest supporters. 'Starting,' wrote one of these critics, 'with nothing but Australia's credit, Sir Denison Miller built securely within the framework of the existing economic order, upsetting nothing essentially good, and by constructive work silencing the destructive criticism that surrounded the birth of the Commonwealth Bank. . . .Sir Denison Miller was not only a big banker, but one of the biggest of Australians. His leadership in banking and in Australian development cannot be assessed in money terms.' (K.C.M.G., 1920.)

Millet. See Sorghum and Millet.

Milletia, a large genus of the family Leguminosae, consisting of trees, shrubs, or climbing plants found chiefly in the warmer regions of Asia and Africa. Three species are endemic in Australia, all being ornamental woody climbers with purple flowers. *M. megastigma* (at one time believed to be a tree) extends from northern New South Wales far into coastal

M. megastigma.

Queensland; *M. Maideniana* is also found in Queensland scrubs, but does not come farther south than Port Macquarie in New South Wales; *M. pilipes* is confined to Queensland. *Milletia* is closely related to the *Wistaria* of our gardens (differing only in the pod), and is sometimes known as native wistaria. In the northern brush forests the plants climb and festoon the loftiest trees. They are occasionally found in cultivation in warm districts as far south as Sydney.

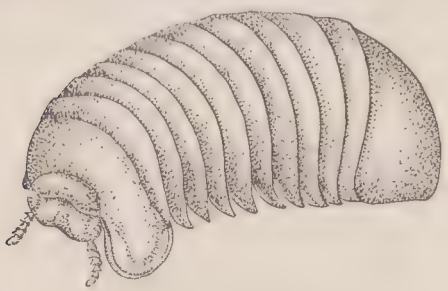
Millipedes, the vernacular name of a class (Diplopoda) of arthropods formerly combined with centipedes (q.v.) in the obsolete order Myriapoda, but now—for reasons mentioned under Centipedes—separated from them. Millipedes are long cylindrical animals with a varying number of horny segments, of which the first four or five bear one pair of legs each, and the rest two pairs. Along their sides are situated a number of 'stink-glands,' from which they can emit an unpleasant odour. In Australia about 21 genera, with 60 species, have been found. The commonest and most conspicuous belong to the family Juloidae; they vary in length from one to ten inches (the larger forms occurring in tropical forests), and are often brightly coloured. Of nocturnal habits, they live under stones, debris, or the bark of trees, and are often seen at rest coiled in a spiral. Their movements are slow, the motion of their short and slender legs being somewhat undula-

tory. Their food consists chiefly, if not entirely, of vegetable matter, frequently the roots of plants. *Spirobellus rainbowi*, from New South Wales, is about two inches long, black with

Dinematocricus falcatus
(three-fourths natural size).

yellow markings. *Dinematocricus falcatus*, a Queensland species, is four inches long, and of a chestnut-brown colour.

The pill-millipedes—so called from their habit of rolling themselves into a ball—belong to the family Zephronidae, species of which also occur in Africa, India, New Zealand, and elsewhere. Their body has 13 segments, of which the sec-



Cyliosoma penrithensis
(one-and-a-half times natural size).

ond and the last are greatly enlarged. In *Cyliosoma penrithensis*, which is about 1½ in. long and ⅝ in. broad, the male is olive-chestnut in colour, darker on the margin of the segments; the female is muddy brown.

The family Cambalidae has four peculiar genera which are indigenous to Western Australia, occurring also in Polynesia, India, and Madagascar. The Polydesmidae—with a cylindrical body of few segments, each having a keel or lobe on its upper surface—are represented by several genera and species. The Polyzoniidae, small worm-like forms with reduced appendages and sucking mouth, are represented by the genera *Orsilochus* and *Siphonotus*. Among Australian members of the allied group Symphyla there is at least one species of *Scutigerella*; this resembles a small centipede both in appearance and movement, and has 12 segments, with a pair of parapodia on each as well as the legs.

See Brolemann in *Records of the Australian Museum*, 1912-13. W.J.R.

Mineralogy. The mineralogy of Australia has usually been studied in connection with the development of her mineral wealth, and its records are to be found principally in the publications of the departments of mines of the different States; comparatively little has been contributed by private workers, and few collections have been formed. It follows that little attention has been given to crystallography, or to the silicates; at the more important mining centres (particularly at Broken Hill) very many specimens of great rarity or beauty must have gone to the smelters and been lost to science. We owe the specimens that have been preserved at Broken Hill mostly to the fact that publicans were willing to give for them a moderate payment in kind. It will be most convenient, therefore, to discuss the subject from the standpoint of mining.

All the important ores and minerals of the base metals, and many of the gemstones, are represented in Australia. Of gold there have been recorded more than 1300 nuggets, ranging from lumps of 20 ounces to the 'Welcome Stranger'—the largest mass of native gold yet found in the world—which yielded 2284 oz. of pure metal (see GOLD, DISCOVERY OF). From the Kalgoorlie goldfield have come the tellurides of gold, silver, and mercury—calaverite, petzite, sylvanite, coloradoite. Native gold is distributed very widely, and has been found associated with many of the ores of the base metals, but crystals are seldom found. Equally varied are the crystalline and other rocks in which it occurs. These are discussed under GOLD.

Definite minerals of which *silver* (q.v.) is the base have not been found to any great extent, except at Broken Hill, and at Yerranderie, west of Camden in New South Wales. The main Broken Hill lode produced in the oxidized zone much native silver, embolite, and iodyrite, and the near-by Consols mine yielded dyscrasite in fine crystalline masses, as well as pyrargyrite and other antimonial compounds of silver. Ruby silver (proustite) ores have been found scantily in the Armidale district of New South Wales and elsewhere. Naumannite (selenide of silver) is reported from near Cloncurry in Queensland. At Broken Hill spongy masses of embolite of great beauty were obtained, and kaolin veined with sulphur-yellow iodyrite or emerald-green embolite yielded fine specimens.

Copper (q.v.) has been mined in many places on a considerable scale, but few minerals of that metal have been recorded, other than those common enough to be used as ores. Beautiful arborescent and other forms of native copper occurred in the upper levels of the Broken Hill lode. Burra Burra in South Australia produced malachite suitable for cutting, and fine crystalline groups came from Peak Downs in Queensland, and from Cobar and Mount Hope in New South Wales. Good crystals of chalcopyrite and tetrahedrite have been found at a deep level of the Mount Lyell mine in Tasmania. Iodide of copper (marshite), a beautiful salmon-pink mineral, is found at Broken Hill, and is not known elsewhere in the world.

Among *lead* minerals (see SILVER), the great variety of superb masses of cerussite found in the Broken Hill lode are particularly noteworthy; arrow-headed twins and delicately reticulated groups of acicular crystals were found in abundance, but suffered much from extreme brittleness. With cerussite, anglesite was often associated. Beautiful satiny specimens came also from Dundas in Tasmania. Altaite has been recorded from Queensland, and a tungstate and molybdate of lead, which appears to be a new mineral, has been described from Chillagoe in Queensland.

Probably the finest crocoite ever seen, in beautiful groups and long pencil-like terminated crystals, was obtained at Dundas. Pyromorphite of various colours and forms was abundant at Broken Hill, and good specimens are known elsewhere. Broken Hill also yielded several varieties of stolzite, and good wulfenite. Stolzite is found also at Westonia in Western Australia.

Oxidized *zinc* (q.v.) minerals are little known,

but blende is a common ore in many metalliferous mines, and is of great industrial importance. Crystallized blende is very rare. Little crystals of zinc carbonate, thickly coating stalactites of cerussite and of manganese oxide, were of common occurrence in the upper levels of the Broken Hill lode. Crystallized gahnite is not uncommon in the schists of the Broken Hill district, and also in the lode itself.

Manganese oxides are widely distributed, but very few analyses have been made. Many of them are certainly psilomelane, but pyrolusite is known. The principal commercial deposits appear to be at Woocalla near Pernatty in South Australia, and near Gladstone in Queensland. Rhodonite is a very important constituent of the Broken Hill lode. Beautiful crystals are found occasionally, and masses of pure mineral are quite common, but these are not suitable for ornamental work. Rose-pink rhodochrosite is found there in vugs.

The more common ores of *iron* (q.v.)—hematite, magnetite, and limonite—are found in quantity in many places, but siderite is known only as a constituent of the gangue of metalliferous lodes. Vivianite and other less common iron-minerals have rarely been recorded, and no doubt search would reveal many more.

Antimony (q.v.) is widely distributed as stibnite, and very fine crystalline groups have been found at Hillgrove and Taylor's Arm in New South Wales. Cervantite, native antimony, and jamesonite are known.

Bismuth (q.v.) ores, both native and sulphide, have been mined to some extent in several States, principally in the granite areas of New South Wales and Queensland. Masses of native bismuth weighing several pounds occurred in the Kingsgate mines in New South Wales. Tetradymite has been recorded in small quantity, and at Mount Shamrock in Queensland and Whipstick in New South Wales the rare telluride joseite. Cosalite and allied lead-bismuth-silver sulphides are known, as is maldonite.

Molybdenite (see MOLYBDENUM) is widely distributed in many granite areas, often associated with bismuth; Queensland and New South Wales have produced what are probably the finest specimens yet seen in the world, including masses of pure mineral weighing hundredweights, and groups of perfect crystals, often of large size. The mines at Deepwater in New South Wales have yielded molybdenite in delicate crystals half an inch long. Ilsemannite and powellite are reported from Queensland, and the latter from Western Australia also.

Ores of *tungsten* (q.v.) have been mined in many places. Scheelite crystals of large size seem to have been numerous in northern Queensland, and were also found at Hillgrove in New South Wales. At King Island off Tasmania it is associated with garnet; it has also been found mixed with stibnite. The so-called cuproscheelite is known. Wolfram (using the term in a broad sense) is the most important ore. Very few analyses have been made, but wolframite, ferberite, and hübnerite all appear to be represented. Well-shaped crystals occurred in quantity at Torrington in New South Wales, but very few have been preserved. Association with cassiterite is not uncommon.

Cinnabar has been recorded from several places in Queensland and New South Wales, and several attempts have been made to work it commercially. In alluvial form it occurs at Cudgegong in New South Wales. Mercurial tetrahedrite was found in the cinnabar mine at Pulganbar in New South Wales, where also masses of pure cinnabar were found at the surface, but none in the mine.

Nickel ores and minerals are scarce. Pentlandite, with its variety heazlewoodite, is recorded from Dundas in Tasmania, and noumeaite from Bingara in New South Wales, both in small quantities. Nickeliferous pyrrhotite occurs in considerable quantity at Dundas. Important bodies of smaltite are being worked (1925) south of Cloncurry in Queensland. Erythrite occurred there, and an association with scheelite was noticed. Cobaltiferous wad has been worked to a small extent at Port Macquarie in New South Wales. A new sulph-antimonide of cobalt, characterized by very distinct cubic crystals, was described from Broken Hill under the name of willyamite.

With regard to *tin* (q.v.), cassiterite is distributed very widely in Queensland, New South Wales, and Western Australia, in both lode and alluvial deposits, more particularly in granitic areas. Large nuggets of pure mineral were found in the alluvial drifts, and fine crystals and crystalline groups were formerly obtainable. 'Resin,' 'ruby,' 'wood,' and several other varieties, including specimens suitable for cutting, and others of a creamy colour, have all been found. Stannite occurs at several places, notably at the Oonah mine in Tasmania and at Howell in New South Wales. Native tin has been reported, but confirmation is needed. Tantalite and stibio-tantalite are associated with the stream tin at Greenbushes in Western Australia. Common associates of cassiterite in granite are beryl and topaz, and, in some cases, wolfram.

No bauxite suitable for the manufacture of *aluminium* under present conditions is known, but laterite approximating thereto occurs in quantity in Western Australia, and also in New South Wales.

Alluvial *platinum* (q.v.), associated with gold, is worked near Fifield in New South Wales. Small nuggets have been found, the largest authenticated weighing nearly 28 dwt. Small cubic crystals are known. Platinum in small quantities is a constant constituent of the heavy sands of northern New South Wales beaches. Appreciable quantities of platinum and other platinoid metals have been detected by assay in the ore of the Walhalla gold-mine in Victoria, and also in decomposed serpentine in the Darling Range near Broken Hill.

Osmiridium (q.v.) is worked in the Savage and Adams river districts of Tasmania; principally in detritus, but also in sound serpentine. Nuggets and crystalline masses, up to 2 oz. in weight, are found occasionally.

Minerals of the *rare earths*, monazite, gadolinite, euxenite, fergusonite, xenotime, have been recorded, more particularly from Western Australia. *Monazite* is widely distributed, both in alluvial deposits and *in situ*, but is not common in large quantities, and the thoria content seems to be always low. Mineral containing five per cent thoria has been reported from Moolyella in Western Australia, and from the Northern Territory. Very fine autunnite and torbernite occur at Mount Painter in South Australia, and a complex *uranium-lead* mineral containing helium has been named pilbarite after the district in Western Australia where it was found. At Radium Hill, Olary (South Australia), carnotite has been mined and a small quantity of *radium* salt extracted (see RADIUM AND ORES). The carnotite at Olary is associated with *titanium* min-

erals, among which a new species, davidite, has been described. Mackintoshite and thorogummite have been found at Wodgina in Western Australia.

Vanadium minerals are scarce, but the metal is widespread in Western Australia in small quantities in clays and laterites. Roscoelite occurs in the Kalgoorlie mines. Carnotite has been mentioned already. Pucherite and vanadinite exist at North Coolgardie and in the Gregory Range (W.A.) respectively. *Tantalite* (and stibio-tantalite) is worked commercially in Western Australia and could be obtained in large quantity if required. A tetragonal form has been described under the name tapiolite. Amblygonite is known in the Northern Territory, in Western Australia, and near Broken Hill, and could be supplied in commercial quantities. Spodumene occurs at Ravensthorpe in Western Australia. *Rutile* has been mined at Blumberg, and is also known elsewhere in South Australia. Sphene from the Northern Territory is another possible source of titanium, and ilmenite is common. Chromite is mined in some of the serpentine areas of New South Wales, but is not of the highest quality. Arsenopyrite is common in the metalliferous mining districts, and a deposit of lollingite is worked (1925) at Delungra in New South Wales.

The commoner rock-forming *silicates* are widely distributed. *Quartz* crystals of large size and varied habit are associated with ores of tungsten, etc., in 'pipe' formations. Twined and double-ended crystals can be obtained, as can also rock-crystal and clear, smoky quartz. Baveno twins of orthoclase are found at Tingha, and a green variety is a constituent of pegmatite in the Broken Hill lode. Albite characterizes some pegmatites in Western Australia. Leucite is a constituent of some basalt flows in New South Wales, and nepheline-bearing tinguaites and syenites are known there and in Victoria. *Muscovite* in sheets of large size, suitable for industrial use, occurs in pegmatite in the Macdonnell Ranges and in Western Australia. From Coolgardie comes a beautiful pink lithium-bearing *mica*, giving an exceptionally clear quasi-uniaxial interference-figure. Lithia biotite is associated with wolfram at Torrington in New South Wales. Masses of *olivine* are included in the ejectamenta of an old volcano at Mount Gambier in South Australia, and a few stones suitable for cutting have been procured at Toowoomba, and in Victoria. Axinite, in lilac-coloured crystal aggregates, constitutes rock-masses in western Tasmania, from which district comes also pretty lilac-coloured stichtite—an oxide and carbonate of magnesium and chromium. Schorl is very common in granite areas.

Zeolites are found in abundance and variety at the basalt quarries near Melbourne, phacolite being especially characteristic. In many other quarries good zeolites are found occasionally, but are little known. Mention may be made of red stilbite from the Liverpool Range in New South Wales, and of prehnite from Prospect, near Sydney.

Amphibole *asbestos* (q.v.) is found in many places. Chrysolite asbestos of very fine quality occurs at Pilbara and Nullagine in Western Australia, but is too far from rail-head to be worked vigorously at present. In Tasmania and New South Wales chrysolite suitable for cement building-sheets has been mined to some extent, but the comparative poverty of the deposits made profitable working impossible. In South Australia the blue crocidolite variety can be had.

Gypsum (q.v.) and *salt* occupy the basins of desiccated lakes in South and Western Australia in large quantity, and important industries are developed (see SALT). In Yorke Peninsula gypsum is raised close to the coast, and is supplied to the plaster and cement industries of the eastern States. There is also much gypsum of moderate quality in Western Victoria and New South Wales. The mineral *selenite* occupied a large cavity in the Mount Elliott copper-mine near Cloncurry, and crystals up to 10 feet in length were obtained. Fine specimens containing moving bubbles have been found. From this cavity came a unique specimen of water-clear selenite, containing between the cleavage-planes the wing of an archaic variety of locust. *Chalcedony* 'waterstones' were common on the Richmond River at one time, and remarkable enhydros with polyhedral outline used to be found at Beechworth in Victoria.

Magnesite (q.v.) of excellent quality occurs in large quantities in several States. *Limestone* of the very finest quality is widespread, often in places very accessible and handy to coal. A very important 'Portland' cement industry is firmly established in New South Wales, and a beginning has been made in other States. Pottery and brick *clays* are plentiful. Pigment clays, more particularly ochres, have been worked to a small extent in South Australia, near Launceston in Tasmania, and elsewhere. Silica sands, suitable for glass and other manufactures, have been proved to exist (see KING, JAMES), but not much is known about them. *Alunite* (q.v.) is mined regularly at Bulladelah in New South Wales, and is known also in South Australia. *Barytes* (q.v.) of excellent quality is supplied from Noarlunga and other localities in South Australia, and also from Tasmania, for the industries of the capital cities. *Fluorite* of metallurgical grade has been mined at Emuford in northern Queensland and at several localities in New South Wales, and pure mineral suitable for enamels can be obtained near Emmaville in New South Wales. Dolomite for furnace-linings is quarried at Lue in New South Wales. Diatomite is obtainable in several localities, and deposits of exceptional texture and purity of colour exist in Victoria. Schists containing workable proportions of *flake-graphite* occur on Eyre Peninsula and in Western Australia, and a low-grade amorphous variety is known at Maryborough in Queensland and elsewhere. Jarosite in workable quantity occurs at Anglesea in Victoria (where it is being utilized) and also in Western Australia. *Phosphate* rock of medium grade is known in South and Western Australia, and has been worked to some extent; but for superphosphate manufacture recourse must be had to the cheap and high-grade mineral from Nauru (q.v.). *Fuller's earth* is worked at Boggabri in New South Wales and is supplied for the industries of the capital cities. Crude *emery* of moderate quality has been discovered in Western Australia and New South Wales.

Good bituminous *coal* (q.v.) is available in the eastern States and in Western Australia. Enormous deposits of lignite await the demands of the future, this being particularly the case in the southern States, where supplies of true coal are less satisfactory. What is perhaps the finest deposit of brown coal in the world, of low ash and water content, is now being developed at Yallourn (q.v.), and will soon be supplying power to a great part of Victoria. The possi-

bilities of the Leigh's Creek deposit in South Australia are being investigated; other deposits are known along the Bight and in Western Australia. In the Dawson River district of Queensland there are extensive beds of semi-anthracite. *Oil-shale* (perhaps better described as torbanite) has been worked to some extent in New South Wales, and large deposits of high-grade mineral, with easy access to rail, will be available when economic conditions are favourable. True oil-shales exist in very large quantity in northern Tasmania, and are known also in Queensland, but no oil has been discovered in Australia (see OIL). *Coorongite* is a rubber-like combustible scum forming at flood-level on certain creeks in South Australia. Its origin has been ascribed variously to vegetation or to the existence of petroleum. Lumps of asphaltum are picked up on the beaches along the whole coast of southern Australia. Its origin is unknown, but apparently it comes from beneath the sea.

Opal (q.v.) is Australia's principal gemstone, in particular black opal from Lightning Ridge in New South Wales. At Whitecliffs in New South Wales remarkable replacements of fossil organisms by opal were found, some of which are of exceptional beauty. Among these organisms were reptilian skeletons, a considerable variety of mollusca, and crinoids, all belonging to the Cretaceous period. Opalized bivalve molluscs have been found in considerable quantity at the Stuart Range opal-field in South Australia, and a few at Lightning Ridge. Of more normal character is the Ballina (New South Wales) opal, which takes the form of infillings of the vesicles of a volcanic rock. *Sapphire* is found at many places in eastern Australia, particularly in the tin wash-dirts. There are two productive fields, Anakie and Inverell. At Inverell several pieces of basalt in which sapphire was embedded were found in the wash, but the original source is not known. *Diamonds* (q.v.) are found in alluvium in eastern Australia, and in conglomerate at Nullagine in Western Australia. Of great scientific interest is a diamond-bearing dolerite dyke at Oakey Creek near Copeton in New South Wales. A 28-carat stone was found at Mount Werong (N.S.W.), but Australian stones are usually small. Bort occurs occasionally. As in the case of sapphire, the source of the diamonds is unknown. Coloured *tourmaline*, suitable for cutting, was at one time procured on Kangaroo Island, and the zeuxite variety is found at Mount Bischoff. *Garnet* of gem quality (formerly regarded as ruby) exists in the Macdonnell Ranges, and crystals of great size and regular shape form part of the gangue of the Broken Hill lode, nor are fine specimens of spessartite and of pyrope rare at Broken Hill. *Zircon* of workable quality is associated with many alluvial deposits and with sapphire at the Anakie and Inverell fields; it also occurs in north-western Tasmania, and on the northern beaches of New South Wales large quantities of pure zircon sand associated with ilmenite could be separated by magnetic concentration. *Topaz* and *beryl* are associated with tin and wolfram in both alluvial and lode deposits, and material suitable for cutting is found occasionally. At Mount Bischoff interesting radial groups of topaz (replacements of quartz-porphyry) were at one time obtainable. *Emeralds* have been found at Poona in Western Australia, and were worked commercially for a time at Emmaville in New South Wales. Aluminium phosphate approximating to turquoise is found at a number of places on the eastern coast, from Rockhampton down, and stones of good colour were obtained in the King Valley in Victoria. Chrysoprase (Comet Vale, Western Australia), agate (northern Queensland), and chiastolite (Bimbowrie, South Australia) call for mention. *Ruby* is very scarce. *Pleonaste*, which is cut occasionally as a setting for brilliants, is found in various gem-sands. Mention may be made of struvite from the Skipton caves in Victoria, of ammonium chloride and ammonium sulphate from guano caves at Wooltana in South Australia, and minerrite from Jenolan Caves; also of gearksutite from Gingin in Western Australia.

A *Bibliography of Australian Mineralogy*, by Charles Anderson, complete to 1916, is published as *Mineral Resources No. 22*, by the Geological Survey of New South Wales. G.W.C.

Miners, perching birds belonging to the genera *Myzantha* and *Manorhina* of the honey-eaters (Meliphagidae) see HONEY-EATERS. The Australian miners were apparently so named by early settlers in Tasmania from the resemblance of their noisy calls to those of the birds known as 'mina' or 'myna' in India (Hindustani *maina*). These are members of the starling family (q.v.) and one of them, the common Indian Myna (*Acridotheres tristis*), has since been introduced into Australia. For the Australian bird the spelling 'miner' seems to have priority; probably the exact spelling of the Indian name was not known to the early settlers. The suggestion that the name was given because the birds were common in the mining districts is obviously incorrect, since Backhouse found it in use in 1832 many years before gold was discovered.

The Noisy Miner (*Myzantha garrula*) is very common in eastern Australia and Tasmania, and is usually called 'soldier-bird' or 'micky.' It is gray, with black-and-whitish markings on the head, the bill and a bare patch round the eye being yellow. It is commonly found in small

Noisy Miner or Soldier-bird (*length* 10 *in.*).

flocks, feeding on the honey of flowers or on fruits; it is very pugnacious, driving away other species when they approach, and constantly uttering its noisy cries. A rather darker bird, the Dusky Miner (*M. obscura*), takes its place in south-western Australia, extending eastwards to north-western Victoria; its habits and notes are very similar. The Yellow-throated Miner (*M. flavigula*) is found in inland districts throughout the continent.

The Bell Miner or Green Bell-bird (*Manorhina melanophrys*), though closely allied in structure, differs markedly from the miners in habits. It is a shy bird, generally frequenting the banks of streams or rivers that run through dense eucalypt forests, and is found in such localities from Vic-

toria to Queensland. Its coloration is dull green, yellowish beneath, with a yellow beak. Its note is a bell-like 'tink,' but, as it is almost always found in small parties, and each individual seems to strike a different note, the combined effect is wonderfully like that of a distant chime of bells. Kendall's 'silver-voiced bellbirds, the darlings of daytime,' belong to this species. W.B.A.

Mining. In its infancy, Australian mining was confined to the winning of gold from shallow alluvial deposits, usually by inexperienced men (e.g. runaway sailors); anyone was a miner who could handle a pick and shovel, and special knowledge was considered unnecessary. The persistence of this notion is partly responsible for the widespread belief that mining is a form of gambling: any business conducted by inexperienced men is a form of gambling. At first comparatively small rich deposits were sought; but large low-grade deposits are now more favoured, because in the long run they pay better.

Mining is divided into three stages, prospecting, developing, and exploitation. Prospecting is generally done by tracing ore from gullies to its source by 'loaming,' 'costeaning' or trenching, tunnels, and shafts. Loaming is taking samples of the soil at right angles to the supposed course of the lode; costeaning or trenching is done first of all at right angles to the supposed course of the lode; when the lode is found, trenching may be continued along its strike. Alluvial ground is tested by boring or sinking shafts, or by a tunnel in cases where there is a covering of basalt on the side of a hill. Sometimes a shaft is sunk and a cross-cut driven to intersect a lead, but the favourite method is boring, because no trouble in pumping is experienced, and a number of bores can be put down for less than the cost of one shaft. In sinking a shaft for lode mining the questions to be considered are these: Is there a suitable approach to the shaft? What is its relation to the rich portions of the lode? Is there a good dump-site for ore and mullock? If the angle of the lode approaches the vertical, what is the depth at which it should be cut? When the lode is wide, it is better to sink on the footwall side, so that the shaft will not be damaged if the workings should collapse.

Ores: Ores of the following metals have been won, or are being won, in Australia, some being mined specially, others obtained as by-products: antimony, arsenic, bismuth, chromium, cobalt, copper, gold, iridium, iron, lead, manganese, mercury, molybdenum, nickel, osmium, platinum, radium, selenium, silver, tantalium, telurium, tin, wolfram, and zinc. In addition, the following are mined: alunite, asbestos, barytes, building-stones (sandstones, slates, marbles, granites, basalt, etc.), clay (fire, brick, pottery), coal, diatomaceous earth, fluorspar, fullers earth, graphite, gypsum, kerosene shale, limestone, magnesite, mica, monozite, ochres, phosphates, precious and semi-precious stones (diamonds, emeralds, garnets, opals, sapphires, turquoise), salt, talc, water (artesian and mineral). See MINERALOGY.

Methods of mining in Australia are as follows:

Dry Blowing.—Dry blowing is resorted to in places where water is scarce. There are many machines designed for this purpose, but the principle is the same in all. Gravel is placed on a shaking screen; the undersize passes into a hopper and thence on to a tray forming the inclined top of a wind-box: this tray consists of a perforated zinc sheet with 'riffles' fixed across it. The wind-box rests on single or double bellows worked by a hand-staff; in order not to disturb the angle of the perforated sheet of zinc, only the bottom of the bellows moves. The wind-box communicates with the bellows by means of valves, and the whole is mounted on a wheelbarrow. The concentrate from the dry blower is still further concentrated by winnowing. This is done—in a spot where there is a strong current of air—by pouring the concentrate from a dish held head-high into another on the ground, so that the wind blows the lighter particles away. When sufficiently reduced in bulk, the concentrate is cleaned by separating the worthless material from the gold with a magnet and blowing it away with the breath. A good deal of gold is lost by this crude method, but local conditions are often such that there is no choice. Winnowing is also used in arid districts for testing ground, just as one would pan-off a 'prospect' in places where there is water.

Panning-off.—For panning-off stanniferous gravel a tinned dish should be employed, since the dark cassiterite is more easily seen against a light surface; unfortunately the tin soon wears off. For panning-off gold, a black iron dish is preferable, since the gold shows up better on it. The dishes are circular in form and are made in three sizes, namely of 17, 15, and 12 in. diameter at the top, and, respectively, 11, 10, and 7½ in. at the bottom. The sides are 4-in. deep. The largest size is the one most used, and 120 dishfuls go to the load. Dishes have a groove round them near the edge to prevent heavy material from sliding out when the dish is tilted, and there is a second groove half-way round and parallel to the upper groove to serve as an additional safeguard. For testing alluvial, the dirt is piled up in the dish and placed under water. The coarse pebbles are then rubbed between the hands to wash off any gold adhering to them, and, when clean, are raked out with the fingers. The gravel having been removed, the finer material is agitated by the hands to make the heavy particles sink to the bottom; then the lighter material is lapped off with water. The dish is righted, the contents swilled round, care being taken not to jerk, for fear the heavy material should become again mixed with the tailings. The dish is then tilted and given a side-to-side motion so as to collect the values at one end; then the lighter material is lapped off as before. These operations are repeated till there is only a small residue. To separate the heavy valuable material from the heavy valueless, the proper way to lap off is by moving a small quantity of water from side to side in the dish, leaving a tail of gold behind; or a little clean water may be dribbled through the fingers on to one end of the residues in order to wash the worthless material down. A dish used for panning-off should never be employed for cooking, since grease is liable to cause a loss of gold.

Ground-sluicing.—This method is used for shallow alluvial deposits, and may also be adopted if the bed-rock is hard and irregular; otherwise sluice-boxes fitted with various forms of riffles are employed. The sluice-box is made in sections of 12-ft., each section being given a grade of 6 inches. When a shallow deposit is to be sluiced, a ditch is cut through the gravel, and water is led on to the ground. The banks of the ditch are then gradually broken

down and washed through the sluice-box, where the gold or tin is caught. Large stones that find their way into the box are removed with a fork, and thrown on one side. Where water is available only at certain times of the year, all preparations should be made during the dry season so as to be ready for the rainy season.

Hydraulicking.—The unit of water in Australia, for mining purposes, is known as a 'sluice-head.' It varies in quantity in different States, but for most of them a 'box-sluice head' means approximately 29 cub. ft. water per minute, and a 'ground-sluice head' 172 cub. ft. per minute. Hydraulicking may be done in a small claim with a low pressure of water coming through a canvas pipe with the neck of a soda-water bottle for a nozzle.

A more elaborate plant may entail miles of ditches (or 'races') flumes, and pipes, with hydraulic 'giants' for undercutting the face and washing the fallen material into the sluice-boxes. This method is employed for high faces of alluvial gold or tin situated above the natural drainage-level. Though the original outlay may be great, subsequent working expenses will be low. The ditches, flumes, and pipes which convey water to the pressure-box are collectively known as the 'head-race.' The pressure-box is a box in which leaves, sand, etc. are strained off and settled, and which allows the water to be sufficiently above the intake to prevent air from being sucked in. From the pressure-box the water is conveyed to the nozzles by a feed-pipe or a number of pipes. The various sections of such a pipe are generally put together stove-pipe fashion, and are kept from coming apart by wire, which passes over hooks riveted near the ends of each section. Air-valves are inserted at suitable places to allow air to escape when filling the pipe, or so that air may be admitted, thus preventing the formation of a vacuum, which might cause the pipe to collapse if all the water should get out in consequence of a breakage. A ditch cut in the bed-rock is called a 'sluice.' At a distance of a few yards from the face, wooden sluice-boxes in 12-ft. lengths are placed in the sluice; obstructions are laid on the bottom of these boxes so as to retain the gold and also the quicksilver which is put in at the top end to catch the gold. These obstructions are known as 'riffles,' and may consist of shingle of approximately the same size and carefully placed by hand, the upper end of the shingle inclining slightly down-stream: or they may be wooden blocks, round in section as when cut from trees: iron rails fastened together in rafts of a weight convenient to handle may be placed either crosswise or lengthwise in the box; angle-iron is used in a similar manner: also cast-iron Venetian riffles.

As the face recedes, the sluice-box is brought forward, and the ditch at the end of the sluice-box becomes the 'tail-race.' The grade of the sluice is regulated by the nature of the gravel. If there are too many large pieces to be forked out, the coarse pieces are passed over a grizzley to a hopper, from which they are trucked away, while the fine material drops between the bars and goes to an undercurrent. One giant nozzle undercuts the 'face,' and, when the face falls, another giant with a larger nozzle washes the gravel into the sluice and thence to the sluice-box. The sluice-boxes are generally cleaned up once a week or fortnight, and the tail-race once or twice a year. When the deposit is below the natural drainage-level of the country, a hydraulic elevator is required. This is an uptake pipe, generally about 15-in. in diameter, up which a 2 to 2¾-in. nozzle conveys water at high pressure, and, playing up the 15 in. pipe, takes up with it the water and gravel from the sump. If there is plenty of water with sufficient head it works effectively.

Hydraulic Dredging.—This, which is really not dredging at all, but hydraulicking with the help of a centrifugal pump, has been much used for re-working old alluvial diggings. The artificial head created by the pump makes a lengthy head-race unnecessary, and alluvial can be worked below the natural drainage-level, since all the machinery is on a barge which, in case of flooding, will float. The gravel is raised by another centrifugal pump to the sluice-boxes situated on the natural surface, so that, in case of flooding, the gold will not be lost. The outlay for plant is not great, and one great advantage is that the cost can be calculated beforehand. There need be little preliminary work, and, if the ground is worth working, it should pay from the start; moreover, the plant being comparatively inexpensive, it can be used for working small isolated deposits where it would not pay to bring in a long head-race. As in ordinary hydraulicking, the bottom can be thoroughly cleaned up. Work is started by making an excavation about 50-ft. square and 6-ft. deep, and the barge is built on the bank of this excavation and launched. The barge is from 35 to 45 ft. long (not counting a 4-ft. tail-board, which is sometimes added), 30-ft. wide, and 4-ft. deep. It draws 3-ft. of water when loaded. The machinery consists of a marine type of boiler 20-ft. long and 7-ft. in diameter, fitted with from 38 to 60 4-in. tubes, and with a working pressure of from 120 to 125 lb. per square inch. The main engine is of from 130 to 170 i.h.p. There are a duplex feed-pump, an air-pump, a condenser, and a steam bilge-pump. The pump is a 12-in. centrifugal, delivering water to a 4-in. nozzle at a pressure of from 60 to 70-lb. per square inch. The pump which raises the gravel to the sluice-box is a 10-in. centrifugal, and there should be a washing-down pump also. The sluice-boxes are from 80 to 120-ft. long, 4-ft. 6-in. wide, and 12-in. deep. The head of the sluice-box is supported on trestles erected on the barge; the rest stands on trestles built on the ground. Most plants have an electric-lighting plant, for which there must be a special engine. By the time the machinery is placed on board, another excavation, alongside the first, has been sunk down to the bed-rock, and a level bed has been made on it for the barge to rest upon. When everything is ready, the excavation is flooded and the barge floated in; then the pump is set to work to empty the excavation, and the barge settles down on the bed-logs. A 20-ft. sump-hole is sunk in the rock near the barge, and is protected by a grating to catch such boulders as may escape the forks of the sluicers. As hydraulicking progresses, races with a grade of 1 in 24 are cut in the bed-rock from the face to the sump. The main race is cut up the centre of the paddock and branch races meet it at suitable angles. At first the tailings have to be stacked on the surface, but when once the barge has been moved up, a brush-and-sand tailings-dam is formed, and the tailings are deposited behind it. The water is drained out of the tailings-dam through a pipe into the lowest part of the new paddock, and can be used over and over again; by this means about two-thirds of the water used is recovered. A paddock consists of

an area of from 1 to 2½ acres. When the working-face gets so far away as to necessitate the cutting of a deeper race to obtain a suitable grade to the sump, from 3 to 4 ft. of water is allowed to accumulate in the paddock, the sluice-boxes on the barge are disconnected from those on the bank, the barge is floated to its new position (where bed-logs have been previously laid), and a new sump is sunk.

Bucket-dredging.—This method is used when in or over the gravel—such as wash in the bed of a watercourse or a river-flat—there is too much water for the employment of either hydraulic sluicing or hydraulic dredging. The gravel is turned over, and though when disturbed it is not so compact as the original deposit, fresh material tending to silt up watercourses is not brought into them as is the case with hydraulic sluicing. The first bucket-dredge in Australia built for gold-dredging was C. L. Garland's, used on the Macquarie River, New South Wales, in 1899. Bucket-dredging is a subject too large to be dealt with here. The best books on it are Earl's *Gold Dredging* (London, 1913) and Prelini's *Dredges and Dredging* (London, 1912).

Open-cut.—The upper portion of wide lodes is removed by this method. Sometimes it is adopted from the beginning, as in the case of Mount Lyell, Tasmania, where the open-cut is 1000-ft. by 800-ft. on the surface and 487-ft. deep; in other cases rich portions of a lode, due to secondary enrichment, are first worked by underground methods and the rest of the lode is subsequently removed by open-cut. This was done at the Broken Hill Proprietary mine, New South Wales, and at Mount Morgan, Queensland. The ideal open-cut is one that goes as deep as the natural drainage of the country, and that does not necessitate the removal, when forming a batter, of more rock than can be immediately used as filling. Double handling is thus obviated, and the ore, if it has to be blended with sulphides for smelting purposes, can be worked in the proper proportion.

With the open-cut there is no fear of missing rich patches of ore; the men are easily supervised; in the daytime the light is natural and the air good; there is no loss of ore in pillars; there is no expense for timbering or filling; there is plenty of room for working, and one can generally lay out larger benches or stopes than are possible underground; besides which all holes are down-holes. On the other hand, work may be hung up by inclement weather, large quantities of waste rock may have to be removed, and a large area of land is rendered valueless.

The brown coal deposit at Yallourn (q.v.), Victoria, is worked by open-cut. At Mount Morgan, Queensland, the soft overburden is removed by steam shovels. For working headings the Whitaker shovel is employed, because the whole platform revolves and the dipper or bucket can therefore empty into buckets at the rear. For sidings where a parallel set of rails can

Principal deposits of copper ore.

be laid for the trucks, the Bucyrus type of shovel was preferred.

In the Iron Knob district, South Australia, the ore is all obtained by open-cuts. The faces vary in height up to 180-ft. and are kept at an angle of 20 deg. from the vertical. Holes are drilled 20-ft. deep with high speed air hammer-drills, spaced about 35-ft. apart laterally, and arranged to have about 30-ft. burden. These holes are 'bulled' or chambered with 50 per cent gelignite, the final blast being made with 25 per cent ligdyn. The holes are fired in groups of from four to ten, the object being to fetch down about 20,000 tons with each blast. The shattered material has to be still further broken up by poppers before it can be loaded into quarry waggons.

Deep Lead Mining.—Shallow alluvial deposits worked in the early days of mining in Victoria had not infrequently to be followed under flows of basalt, and, since gravel holds water like a sponge, the country had to be drained before the wash could be worked. In other cases molten lava, which naturally sought the low-lying land, covered the ancient watercourses, and when it solidified, being harder than the adjoining sedimentary rocks, it better withstood the action of the weather. Basalt protecting the gravel on the higher ground was reached by tunnels driven into the side of the hill.

There are two methods used in Victoria for laying out the workings of deep leads; one (known as the 'down-country' method) is used in the southern districts; the other (the 'up-country' method) is used farther north. The up-country method originated at Chiltern in Victoria.

In the *down-country method* a shaft is sunk clear of the alluvial (the position and depth having been previously determined by bore-holes) and, when this is well below the deepest part of the wash, a cross-cut is driven underneath, and from this a main or reef drive is cut in the supposed direction of the ancient watercourse. The cross-cut is made high, so as to allow room for the water which will probably be tapped to flow under the footboards. The cross-cut and main drive are made as level as possible (consistently with drainage towards the shaft), so that, in case of a rush of water, the mouth of the horizontal passage will not be sealed up so quickly as it would be had it been given a steeper grade. This gives the miners a better chance of escaping, and also (since the down-stream drive has a grade in the opposite direction to that of the original river) it does not intersect the wash so soon as if it were steeper. Every now and again branches are driven at right angles to the main drive, and in the roof of these bore-holes are put up. These not only serve to drain the wash, but also give information of any change in direction of the old watercourse, and so enable the direction of the main drive to be changed accordingly. At suitable distances apart, so-called 'balance shafts' are raised, but not in such a way as

Principal deposits of iron and manganese.

to reach the wash; from the top of a balance shaft an intermediate drive is driven. The balance shaft consists of two cage compartments and a ladderway. A cage is fastened to each end of a rope, which has two or three turns round a pulley overhead, and a brake is attached to the side of the pulley, regulating the rate at which the full cage descends and raises the empty cage. An intermediate level, started in the bed-rock or 'reef,' is connected by occasional jump-ups (i.e. chutes for sending down the wash) with a drive made in the wash, and there is a ladderway for the men. The grade of the bed of the ancient watercourse, being more or less irregular, is not suitable for long trucking, and the wash is therefore sent down to the intermediate drive as soon as possible; the upkeep of a wash drive being greater than that of a drive in rock, sections of it are abandoned as soon as they are worked out. The down-stream intermediate drive, having a grade in the opposite direction to the wash drive, eventually penetrates it, and then the intermediate becomes the wash drive and the main drive takes the place of the intermediate.

In the *up-country method* a shaft is sunk to below the wash-dirt; a cross-cut is driven, from which various drives branch off up and down in the supposed direction of the deepest portion of the deposit; and drainage bores are put up into the wash. Higher up the shaft another cross-cut is driven over the one below, at such a depth from the surface that it will intersect the lowest portion of the wash. Before it cuts the wash, however, it branches off up and down stream, forming what is known as 'reef drives.' Branches at right angles are driven from the reef drives right across the deposit, and parallel wash drives are driven up and down stream at right angles to and connecting these, thus dividing the wash into blocks; the wash is dropped down chutes to the main reef drive. The upper drive helps to ventilate, serves for bringing in timber, and in case of a rush of water gives men a better chance of escaping.

Two methods of extracting the wash are known respectively as 'blocking' and 'panelling.' At one time the wash met with in drives was tested by panning, and, if payable gold was shown, extraction would be continued, but if no gold was shown the block was left. Later on it was proved better to extract all the wash systematically, since testing the sides of a drive in this rough manner furnishes no true criterion of the block. To prepare the wash for blocking or panelling, cross-drives, 150-ft. apart, are made on each side of the main wash-dirt drive, and from the sides of these cross-drives, at intervals of 32-ft., truck roads are driven; a strip 16-ft. wide is thus left on each side of them.

Panelling is used when the pay dirt is less than 4-ft. thick. The mine is opened up into blocks, and the wash-dirt is taken out in strips 4-ft. 6-in. wide. Where the wash is less than 2-ft. 6-in. thick, it is necessary to take out enough rock to give a working-space of 2-ft. 6-in. While the wash is being extracted, the roof is supported by laths resting on panelling props—pieces of round or split timber from 2½ to 3 inches thick. The truck roads are made lower than the panel, so that the dirt can be easily shovelled into trucks. Panelling is paid for at per square fathom of 36-sq. ft., irrespective of the height.

Blocking is used when the ground taken out is 4-ft. thick or over, or when it is too loose for panelling. Cross-cuts are driven on both sides of the main wash-dirt drive and at right angles to it, from 200 to 300 ft. apart. These cross-drives are connected every 46-ft. by blocking drives. Allowing 6-ft. for the width of the blocking drive, a solid block or pillar 40-ft. wide will be left. This pillar is divided lengthwise down the middle by an imaginary line. Two miners and a trucker per shift make up a party, and each miner works up to the imaginary line, or 20-ft. from the blocking drives on either side of the pillar, beginning at the end nearest the worked-out ground. All the blocks in a section are worked simultaneously, so as to keep the face even right across the lead; the ground overhead is allowed to fall in after the pay dirt has been extracted. At Chiltern, Victoria, the miners extracted 2-ft. of wash and 1½-ft. reef bottom. Blocking strips are 8-ft. wide, and, as the timber is only required to support the roof for a short time, light props are used, placed about 4-ft. apart; on top of these are caps, generally 8-ft. long; if the roof is crumbly, back laths are also necessary. Blocking is done by contract at so much per running foot, the width being always 8-ft.

Underhand Stoping.—This method is used to a very limited extent, and that mostly in small mines in which it is desired to win ore underfoot without the expense of opening up a lower level.

Overhand Stoping.—Most underground extraction of ores is done by some form of overhand stoping, such as breast, flat-back, rill, shrinkage, etc.

Breast stoping is used for certain narrow lodes. The breast may be parallel to the strike when the underlay is flat, or at right angles to it if the underlay is steep. In the former case it is sometimes known as a 'long-wall' stope, and in the latter as 'incline cut and fill,' since the face is inclined in one direction and the subsequent filling in the opposite direction. This method can be used only if the walls will stand till the excavation can be filled. No passes are required, since the ore falls down the incline, but it is rather dangerous for men when others are working above them.

Flat-back method.—An advantage of this method is that, when there are horizontal joints, slabs of ore may be shot down, and in falling they break up. Filling is generally brought up sufficiently high to enable the miners to stand on it when breaking down ore, and the necessity of rigging up a staging is thus avoided.

Shrinkage method.—This is somewhat similar to the flat-back method, but instead of the worked-out space being filled with waste as mining proceeds, broken ore is allowed to remain behind. This method has been used at the Great Boulder Perseverance, Lake View Consols, Great Fingall, and other mines in Western Australia.

A combination of flat-back and shrinkage methods is sometimes employed if the ground will permit, as at the Great Cobar mine in New South Wales. For some 20 to 30 ft. the ore is broken as for the shrinkage system: the sill floor and leading stope are taken out together, the face being on a slope, so that the miners can reach the roof. When each stope reaches the required height, all the ore is drawn, and the space is filled with mullock. One objection to this method is that a stope may remain out of commission for a long time while the ore is being withdrawn and the space mullocked up; in certain cases this might cause a considerable variation in the production of a mine. A shrink-

age-stope from which the ore has been drawn may be allowed to fall in, or it may be filled up.

Rill or Sloping Stope method.—In this case a winze is sunk and a leading stope started on each side of it at an angle slightly flatter than the angle of repose of broken ore; the ore is removed, ore-passes are built where required, and mullock sent down the winze comes to rest at the angle of repose and is allowed to fill up to within from 2 to 4 ft. of the roof. Planks are laid on the filling to prevent ore from becoming mixed with it and getting lost or contaminated, and another slice of 5-ft. to 8-ft. ore is broken down. When this ore has been sent down passes, the planks are taken up, more filling is run in, and the same routine repeated. Matters are so arranged that ore-extraction is taking place on one side of the winze while filling is being done on the other. When the stope is nearly worked out, it is usual to sink a subsidiary winze in the triangular block of ore left, through which filling can be dropped.

If a lode is very wide, as at Mount Morgan, it may be divided up lengthwise into strips about 50-ft. wide, each strip being stoped independently of the other, except that each is kept in advance of the next. A rearing of poles is placed between the unworked ore and the filling of the different strips, so that ore and filling shall not become mixed.

Ore-passes.—These are built up from below as the ore is extracted, and should be so situated that ore can be easily sent down them to the level below. They may be rectangular or circular in cross-section, and may be single or double. In wide lodes double passes are used, for the reason that a single pass is likely to become worn out before the stope is completed. With a double pass, one compartment is used for sending down the ore, and the other as a ladderway. Rectangular passes are logged up, and their tops are kept a little higher than the filling, so as to prevent mullock from falling into them and contaminating the ore. The ladder compartment should be built up high, so that ore shall not be shovelled into it by mistake and possibly injure someone travelling up or down.

At Broken Hill, circular passes both of wood and iron have been designed. These, being smooth inside, do not offer the same resistance as logs, and consequently do not wear so quickly; hence there is no necessity to build double passes. As the upper portion of a pass has less wear and tear than the lower, the wooden passes are made in sections of different thickness. Those of the lower 30-ft. are 4-ft. in diameter with staves 10-in. thick, while those of the top 30-ft. are 3-ft. in diameter with 4-in. to 5-in. thick staves: the staves, which are from 4 to 8 ft. long, are bound together with fencing-wire, with two strands at the top and two at the bottom, tightened round two short pins on the Spanish windlass principle.

A pass may hang up if it is crooked or at too flat an angle, if drills fall down and get stuck crosswise, if the ore is sticky, or the lumps too big. Sometimes the difficulty can be overcome from the ladderway, or it may be reached by digging down from above, in which case the miner should have a rope attached to him, for fear the ore may suddenly run. It is very dangerous to try to free the block by poking from below, and this should not be allowed. Perhaps the best method is to use a 'cannon' designed at Moonta, South Australia, and now used in other Australian mines. It consists of a mild steel cylinder 12-in. long and 4-in. in diameter; a 2-in. hole is bored down its length for 10-in., and ½-in. from the bottom of this hole there is drilled a touch-hole for a fuse. The cylinder is further strengthened by three wrought iron rings 1-in. thick. A full charge is from 10 to 14 oz. of blasting powder—nitroglycerine compounds are not allowed, since they would burst the metal. Some earth is tamped on the top of the powder, and sometimes on this again, iron punchings of from ⅛ to ¼-in. diameter by ½ to ⅝-in. thick. The cannon is placed on the bottom of the pass and fired by a fuse. It is the shock rather than the punchings that shifts the ore.

Coal (q.v.) is worked by some variety of 'bord and pillar' or 'longwall.' The bord and pillar method is the one more generally used and consists in working out oblong chambers from 4 to 12 yds. wide, leaving pillars of coal between to support the roof for the time being: this is known as 'working in the solid;' when the pillars are being extracted it is known as 'broken working.' In the early days it was usual to rob the pillars till they could no longer stand the overhead weight and therefore crushed; nowadays, after a few bords are driven, the pillars are extracted as soon as possible, before they get weakened by standing. In this way much less coal is wasted.

In the Maitland district of New South Wales, where the coal is liable to spontaneous combustion, the workings are laid out on the panel system (i.e. a barrier pillar is left round an area of coal which is left intact except for absolutely necessary passages). The coal in each panel is worked as a separate mine, so that, should a fire break out in one panel, it can be sealed off and work can be continued in other panels without hindrance. This system is used at Lambton B. Colliery, where each panel is 23½ chains square with 16-yd. barrier pillars; at Hebburn Colliery, where the panels are 20 chains square and the barrier pillars 33-yds. wide; also at East Greta Colliery and Stanford Merthyr Colliery, all in New South Wales.

The long-wall system is used for thin seams such as those at the Sydney Harbour Colliery, Stockton Borehole Colliery, and, in part, at North Bulli and Mount Kembla, all in New South Wales, and in the Victorian State Coal Mine, Wonthaggi. More coal is won with the long-wall method than with the bord and pillar.

Largest Australian Mine Shafts. Most Australian colliery shafts are circular in cross section and lined with brick where necessary, the colonial bond being used, i.e. three rows of stretchers to one of headers. At the Bulli colliery there is a concrete-lined shaft 16-ft. in diameter. Cast-iron tubing of the English pattern has been used in some of the collieries so as to cut off waterbearing strata—for example, at the Balmain colliery (Sydney) and the Lambton B and Delta collieries (near Newcastle, N.S.W.); but the two last named are now closed. The deepest pair of colliery shafts are at the Balmain colliery; they are 18-ft. in diameter and 2900-ft. deep. The next deepest are at the Metropolitan colliery, Helensburgh, N.S.W., being 15-ft. in diameter and 1100-ft. deep. Metal mines in Australia are mostly oblong in cross section and are supported by timber. The two deepest are the Victoria Consolidated (over 4600-ft.) and the New Chum (over 4100-ft.) both gold-mines at Bendigo, Victoria. The usual size of shafts for Australian gold-mines is 12-ft. by 4-ft., divided into two hoisting compartments of 3-ft. 6-in. by 4-ft. inside timbers, and a pump and ladderway 4-ft. 6-in. by 4-ft.

F.D.P.

Ministries, Federal, Colonial, and State, since the establishment of responsible government.

COMMONWEALTH.

KEY TO OFFICE.

1. Prime Minister.
2. Minister for External Affairs.
3. Attorney-general.
4. Minister for Home Affairs.
5. Treasurer.
6. Minister for Trade and Customs.
7. Minister for Defence.
8. Postmaster-general.
9. Vice-president of the Executive Council.
10. Minister for the Navy.
11. Minister for Repatriation.
12. Minister for Works and Railways.
13. Minister for Home and Territories.
14. Minister for Health.
15. Minister for Markets and Migration.
16. Honorary Minister (sometimes called Assistant Minister, or Minister without Portfolio).

I.—BARTON MINISTRY.

Name.	Office.	From—	To—
Edmund Barton	1-2	1/1/1901	24/9/1903
Alfred Deakin	3	,,	,,
Sir W. J. Lyne	4	,,	7/8/1903
succeeded by			
Sir John Forrest	4	7/8/1903	24/9/1903
Sir G. Turner	5	1/1/1901	,,
C. C. Kingston	6	,,	24/7/1903
succeeded by			
Sir W. J. Lyne	6	7/8/1903	24/9/1903
Sir J. R. Dickson ...	7	1/1/1901	10/1/1901
succeeded by			
Sir John Forrest	7	17/1/1901	7/8/1903
succeeded by			
J. G. Drake (Senator) ...	7	7/8/1903	24/9/1903
Sir John Forrest	8	1/1/1901	17/1/1901
succeeded by			
J. G. Drake (Senator) ...	8	5/2/1901	7/8/1903
succeeded by			
Sir P. O. Fysh	8	7/8/1903	24/9/1903
R. E. O'Connor (Senator)	9	1/1/1901	,,
Neil E. Lewis	16	,,	23/4/1901
Sir P. O. Fysh	16	26/4/1901	7/8/1903

II.—DEAKIN MINISTRY.

Alfred Deakin	1-2	24/9/1903	27/4/1904
Sir W. J. Lyne	6	,,	,,
Sir George Turner ...	5	,,	,,
Sir John Forrest	4	,,	,,
J. G. Drake (Senator) ...	3	,,	,,
Sir P. O. Fysh	8	,,	,,
Austin Chapman	7	,,	,,
Thomas Playford (Senator)	9	,,	,,

III.—WATSON MINISTRY.

J. C. Watson	1-5	27/4/1904	17/8/1904
W. M. Hughes	2	,,	,,
H. B. Higgins	3	,,	,,
E. L. Batchelor	4	,,	,,
Andrew Fisher	6	,,	,,
A. Dawson (Senator) ...	7	,,	,,
Hugh Mahon	8	,,	,,
Gregor McGregor (Senator)	9	,,	,,

IV.—REID-McLEAN MINISTRY.

G. H. Reid	1-2	17/8/1904	5/7/1905
Allan McLean	6	,,	,,
Sir J. H. Symon (Senator)	3	,,	,,
Sir G. Turner	5	,,	,,
Dugald Thomson ...	4	,,	,,
J. W. McCay	7	,,	,,
Sydney Smith	8	,,	,,
J. G. Drake (Senator) ...	9	,,	,,

V.—DEAKIN MINISTRY.

Alfred Deakin	1-2	5/7/1905	13/11/1908
I. A. Isaacs	3	,,	12/10/1906
succeeded by			
L. E. Groom	3	12/10/1906	13/11/1908
Sir W. J. Lyne	6	5/7/1905	30/7/1907
succeeded by			
Austin Chapman	6	30/7/1907	13/11/1908

V.—DEAKIN MINISTRY (*continued*).

Name.	Office.	From—	To—
Sir John Forrest	5	5/7/1905	30/7/1907
succeeded by			
Sir W. J. Lyne	5	30/7/1907	13/11/1908
Austin Chapman	8	5/7/1905	30/7/1907
succeeded by			
Samuel Mauger	8	30/7/1907	13/11/1908
Thomas Playford (Senator)	7	5/7/1905	24/1/1907
succeeded by			
T. T. Ewing	7	24/1/1907	13/11/1908
L. E. Groom ...	4	5/7/1905	12/10/1906
succeeded by			
T. T. Ewing	4	12/10/1906	24/1/1907
succeeded by			
J. H. Keating (Senator) ...	4	24/1/1907	13/11/1908
T. T. Ewing	9	5/7/1905	12/10/1906
succeeded by			
J. H. Keating (Senator) ...	9	12/10/1906	20/2/1907
succeeded by			
R. W. Best (Senator) ...	9	20/2/1907	13/11/1908
J. H. Keating (Senator) ...	16	5/7/1905	12/10/1906
Samuel Mauger	16	12/10/1906	30/7/1907
J. H. Cook	16	28/1/1908	13/11/1908

VI.—FISHER MINISTRY.

Andrew Fisher	1-5	13/11/1908	2/6/1909
W. M. Hughes	3	,,	,,
E. L. Batchelor	2	,,	,,
Hugh Mahon	4	,,	,,
Josiah Thomas	8	,,	,,
G. F. Pearce (Senator) ...	7	,,	,,
F. G. Tudor	6	,,	,,
Gregor McGregor (Senator)	9	,,	,,
J. Hutchison	16	,,	,,

VII.—DEAKIN MINISTRY.

Alfred Deakin	1	2/6/1909	29/4/1910
Joseph Cook	7	,,	,,
Sir J. Forrest	5	,,	,,
Sir R. W. Best (Senator)...	6	,,	,,
L. E. Groom	2	,,	,,
P. McM. Glynn	3	,,	,,
Sir John Quick	8	,,	,,
G. W. Fuller	4	,,	,,
E. D. Millen (Senator) ...	9	,,	,,
J. F. G. Foxton	16	,,	,,

VIII.—FISHER MINISTRY.

Andrew Fisher	1-5	29/4/1910	24/6/1913
W. M. Hughes	3	,,	,,
E. L. Batchelor	2	,,	8/10/1911
succeeded by			
Josiah Thomas	2	14/10/1911	24/6/1913
Josiah Thomas	8	29/4/1910	14/10/1911
succeeded by			
C. E. Frazer	8	14/10/1911	24/6/1913
G. F. Pearce (Senator) ...	7	29/4/1910	,,
F. G. Tudor	6	,,	,,
King O'Malley	4	,,	,,
Gregor McGregor (Senator)	9	,,	,,
Edward Findley (Senator)	16	,,	,,
C. E. Frazer	16	,,	14/10/1911
E. A. Roberts	16	23/10/1911	24/6/1913

IX.—COOK MINISTRY.

Joseph Cook	1-4	24/6/1913	17/9/1914
Sir John Forrest	5	,,	,,
W. H. Irvine	3	,,	,,
E. D. Millen (Senator) ...	7	,,	,,
P. McM. Glynn	2	,,	,,
L. E. Groom	6	,,	,,
Agar Wynne	8	,,	,,
J. H. McColl (Senator) ...	9	,,	,,
W. H. Kelly	16	,,	,,
J. S. Clemons (Senator) ...	16	,,	,,

X.—FISHER MINISTRY.

Andrew Fisher	1-5	17/9/1914	27/10/1915
W. M. Hughes	3	,,	,,
G. F. Pearce (Senator) ...	7	,,	,,
F. G. Tudor	6	,,	,,
J. A. Arthur	2	,,	9/12/1914
succeeded by			
Hugh Mahon	2	14/12/1914	27/10/1915
W. O. Archibald	4	17/9/1914	,,
W. G. Spence	8	,,	,,
A. Gardiner (Senator) ...	9	,,	,,
J. A. Jensen	10	12/7/1915	,,
J. A. Jensen	16	17/9/1914	12/7/1915
Hugh Mahon	16	,,	14/12/1914
E. J. Russell (Senator) ...	16	,,	27/10/1915

XI.—HUGHES MINISTRY.

Name.	Office.	From—	To—
W. M. Hughes	1-3	27/10/1915	14/11/1916
W. M. Hughes	6	29/9/1916	,,
G. F. Pearce (Senator) ...	7	27/10/1915	,,
F. G. Tudor	6	,,	,,
Hugh Mahon	2	,,	,,
J. A. Jensen	10	,,	,,
W. G. Higgs	5	,,	27/10/1916
King O'Malley	4	,,	14/11/1916
William Webster	8	,,	,,
Albert Gardiner (Senator)..	9	,,	27/10/1916
Edward J. Russell (Senator)	16	,,	,,

XII.—HUGHES MINISTRY.

W. M. Hughes	1-3	14/11/1916	17/2/1917
G. F. Pearce (Senator) ...	7	,,	,,
J. A. Jensen	10	,,	,,
William Webster	8	,,	,,
A. Poynton	5	,,	,,
W. O. Archibald	6	,,	,,
F. W. Bamford	4	,,	,,
P. J. Lynch (Senator) ...	12	,,	,,
W. G. Spence	9	,,	,,
E. J. Russell (Senator) ...	16	,,	,,
W. H. L. Smith	16	,,	,,

XIII.—NATIONAL WAR GOVERNMENT.

W. M. Hughes	1-3	17/2/1917	8/1/1918
Joseph Cook	10	,,	,,
Sir J. Forrest	5	,,	,,
G. F. Pearce (Senator) ...	7	,,	,,
E. D. Millen (Senator) ...	9	,,	16/11/1917
succeeded by			
L. E. Groom	9	16/11/1917	8/1/1918
W. A. Watt	12	17/2/1917	,,
P. McM. Glynn	13	,,	,,
J. A. Jensen	6	,,	,,
William Webster	8	,,	,,
E. D. Millen (Senator) ...	11	28/9/1917	,,
E. J. Russell (Senator) ...	16	17/2/1917	,,
L. E. Groom	16	,,	16/11/1917

XIV.—SECOND NATIONAL WAR GOVERNMENT.

W. M. Hughes	1-2	10/1/1918	9/2/1923
W. M. Hughes	3	,,	21/12/1921
succeeded by			
L. E. Groom	3	21/12/1921	9/2/1923
L. E. Groom	9	10/1/1918	27/3/1918
succeeded by			
E. J. Russell (Senator) ...	9	27/3/1918	21/12/1921
succeeded by			
John Earle	9	21/12/1921	9/2/1923
W. A. Watt	12	10/1/1918	27/3/1918
L. E. Groom	12	27/3/1918	21/12/1921
succeeded by			
R. W. Foster	12	21/12/1921	9/2/1923
Sir J. Cook	10	10/1/1918	28/7/1920
succeeded by			
W. H. L. Smith	10	28/7/1920	21/12/1921
Lord Forrest	5	10/1/1918	27/3/1918
succeeded by			
W. A. Watt	5	27/3/1918	15/7/1920
succeeded by			
Sir J. Cook	5	28/7/1920	21/12/1921
succeeded by			
S. M. Bruce	5	21/12/1921	9/2/1923
G. F. Pearce (Senator) ...	7	10/1/1918	21/12/1921
succeeded by			
W. M. Greene	7	21/12/1921	9/2/1923
E. D. Millen (Senator) ...	11	10/1/1918	,,
P. McM. Glynn	13	,,	3/2/1920
A. Poynton	13	4/2/1920	21/12/1921
succeeded by			
G. F. Pearce (Senator) ...	13	21/12/1921	9/2/1923
W. M. Greene	14	10/3/1921	,,
J. A. Jensen	6	10/1/1918	13/12/1918
succeeded by			
W. A. Watt ...	6	13/12/1918	17/1/1919
succeeded by			
W. M. Greene	6	17/1/1919	21/12/1921
succeeded by			
A. S. Rodgers	6	21/12/1921	9/2/1923
William Webster	8	10/1/1918	3/2/1920
succeeded by			
G. H. Wise	8	4/2/1920	21/12/1921
succeeded by			
A. Poynton	8	21/12/1921	9/2/1923
E. J. Russell (Senator) ...	16	10/1/1918	27/3/1918
W. M. Greene	16	26/3/1918	17/1/1919
A. Poynton	16	,,	4/2/1920
R. B. Orchard	16	,,	31/1/1919
G. H. Wise	16	,,	4/2/1920
W. H. L. Smith	16	4/2/1920	28/7/1920
Sir G. de L. Ryrie ...	16	,,	9/2/1923
A. S. Rodgers	16	28/7/1920	21/12/1921
Hector Lamond	16	21/12/1921	9/2/1923

XV.—BRUCE-PAGE MINISTRY.

Name.	Office.	From—	To—
S. M. Bruce	1-2	9/2/1923	
E. C. G. Page	5	,,	
G. F. Pearce (Senator) ...	13	,,	18/6/1926
succeeded by			
Sir T. W. Glasgow	13	18/6/1926	
Sir L. E. Groom	3	9/2/1923	18/12/1925
succeeded by			
J. G. Latham	3	18/12/1925	
W. G. Gibson	8	9/2/1923	
Sir A. Chapman	6-14	,,	26/5/1924
succeeded by			
H. E. Pratten	6	13/6/1924	
H. E. Pratten	14	,,	16/1/1925
succeeded by			
Sir N. R. Howse	14	16/1/1925	
P. G. Stewart	12	9/2/1923	5/8/1924
succeeded by			
W. C. Hill	12	26/9/1924	
E. K. Bowden	7	9/2/1923	16/1/1925
succeeded by			
Sir N. R. Howse	7	16/1/1925	
L. Atkinson	9	9/2/1923	18/6/1926
succeeded by			
G. F. Pearce (Senator) ...	9	18/6/1926	
Sir V. Wilson (Senator) ...	15	16/1/1925	18/6/1926
succeeded by			
T. Paterson	15	18/6/1926	
Sir V. Wilson (Senator) ...	16	9/2/1923	16/1/1925
succeeded by			
C. W. C. Marr	16	16/1/1925	
T. W. Crawford (Senator)	16	9/2/1923	

NEW SOUTH WALES.

KEY TO OFFICE.

1. Premier (called Prime Minister till 1901).
2. Colonial—afterwards called Chief—Secretary.
3. Colonial Treasurer.
4. Attorney-general.
5. Solicitor-general.
6. Auditor-general.
7. Secretary for Lands and Public Works.
8. Secretary for Lands.
9. Secretary (or Minister) for Public Works.
10. Postmaster-general.
11. Secretary for Mines.
12. Minister of Justice and Public Instruction.
13. Minister of Justice.
14. Minister of Public Instruction.
15. Vice-president of the Executive Council.
16. Representative in the Legislative Council.
17. Minister for Agriculture.
18. Secretary for Mines and Agriculture.
19. Minister of Labour and Industry.
20. Minister of Public Health.
21. Minister for Forests.
22. Minister for Railways.
23. Minister for Local Government.
24. Minister for Housing.
25. Minister for Motherhood.
26. Minister for State Industrial Enterprises.
27. Honorary Minister (sometimes called Minister without Portfolio).

Acting Ministers (and Ministers 'charged with the duties of'), bear the key number of the minister they acted for, plus the letter A.

Assistant Ministers bear the key number of the minister they assisted, plus the letter B.

I.—DONALDSON MINISTRY.

Name.	Office.	From—	To—
S. A. Donaldson	1-2	6/6/1856	25/8/1856
Thomas Holt	3	,,	,,
W. M. Manning	4	,,	,,
J. B. Darvall	5	,,	,,
G. R. Nichols	6-7	,,	,,
W. C. Mayne, M.L.C. ...	16	4/8/1856	,,

II.—COWPER MINISTRY.

Charles Cowper	1-2	26/8/1856	2/10/1856
R. Campbell	3	,,	,,
T. A. Murray	7	,,	,,
James Martin	4	,,	,,
T. A. Murray	6	,,	17/9/1856
A. J. P. Lutwyche, M.L.C.	5-16	12/9/1856	2/10/1856

III.—PARKER MINISTRY.

Name.	Office.	From—	To—
H. W. Parker	1-2	3/10/1856	7/9/1857
S. A. Donaldson	3	,,	,,
John Hay	7	,,	,,
W. M. Manning ... ... succeeded by	4	,,	25/5/1857
J. B. Darvall	4	26/5/1857	7/9/1857
J. B. Darvall ... ... succeeded by	5	3/10/1856	25/5/1857
Edward Wise	5	26/5/1857	7/9/1857
E. Deas Thomson, M.L.C.	15-16	,,	,,

IV.—COWPER MINISTRY.

Charles Cowper	1-2	7/9/1857	26/10/1859
Richard Jones ... ... succeeded by	3	,,	3/1/1858
R. Campbell ... ... succeeded by	3	4/1/1858	30/3/1859
E. C. Weekes	3	18/4/1859	26/10/1859
T. A. Murray ... ... succeeded by	7	7/9/1857	12/1/1858
John Robertson	7	13/1/1858	30/9/1859
John Robertson	8	1/10/1859	26/10/1859
Edward Flood	9	,,	,,
James Martin ... ... succeeded by	4	7/9/1857	8/11/1858
A. J. P. Lutwyche ... succeeded by	4	15/11/1858	28/2/1859
L. H. Bayley	4	1/3/1859	26/10/1859
A. J. P. Lutwyche ... succeeded by	5	7/9/1857	14/11/1858
W. B. Dalley ... ... succeeded by	5	15/11/1858	11/2/1859
J. F. Hargrave	5	21/2/1859	26/10/1859
J. Dickson, M.L.C. ...	16	,,	,,

V.—FORSTER MINISTRY.

William Forster	1-2	27/10/1859	8/3/1860
Saul Samuel	3	,,	,,
John Black	8	,,	,,
G. Eagar, M.L.C. ...	9-16	,,	,,
Edward Wise ... ... succeeded by	4	,,	13/2/1860
Sir W. M. Manning ...	4	21/2/1860	8/3/1860
J. F. Hargrave, M.L.C. ...	5	3/11/1859	,,

VI.—ROBERTSON MINISTRY.

John Robertson	1-8	9/3/1860	Merged into Cowper Ministry, 9/1/1861
Charles Cowper	2	,,	,,
E. C. Weekes	3	,,	,,
W. M. Arnold	9	,,	,,
J. F. Hargrave, M.L.C. ...	4-16	2/4/1860	,,

VII.—COWPER MINISTRY.

Charles Cowper	1-2	10/1/1861	15/10/1863
E. C. Weekes ... ... succeeded by	3	,,	20/3/1863
T. W. Smart	3	21/3/1863	15/10/1863
John Robertson	8	10/1/1861	,,
W. M Arnold	9	,,	,,
J. F. Hargrave, M.L.C. ... succeeded by	4	,,	31/7/1863
J. B. Darvall	4	1/8/1863	15/10/1863
J. F. Hargrave, M.L.C. ...	5	,,	,,
J. F. Hargrave, M.L.C. ...	16	10/1/1861	,,

VIII.—MARTIN MINISTRY.

James Martin	1-4	15/10/1863	2/2/1865
William Forster	2	,,	,,
Geoffrey Eagar	3	,,	,,
Peter Faucett	5	,,	,,
J. B. Wilson	8	,,	,,
A. T. Holroyd	9	,,	,,
J. H. Plunkett, M.L.C. ...	15-16	,,	,,

IX.—COWPER MINISTRY.

Charles Cowper	1-2-15	3/2/1865	21/1/1866
T. W. Smart ... ... succeeded by	3	,,	19/10/1865
Saul Samuel ... ... succeeded by	3	20/10/1865	3/1/1866
Marshall Burdekin ...	3	4/1/1866	21/1/1866
J. B. Darvall ... ... succeeded by	4	3/2/1865	20/6/1865
J. H. Plunkett	4	25/8/1865	21/1/1866
J. F. Hargrave, M.L.C. ...	5-16	3/2/1865	21/6/1865
John Robertson ... ... succeeded by	8	,,	19/10/1865
W. M. Arnold ... ... succeeded by	8	20/10/1865	31/10/1865
John Robertson	8	1/1/1866	21/1/1866
W. M. Arnold ... ... succeeded by	9	3/2/1865	19/10/1865
T. W. Smart	9	20/10/1865	21/1/1866
J. A. Cunneen	10	1/10/1865	,,

X.—MARTIN MINISTRY.

Name.	Office.	From—	To—
James Martin	1-4-15	22/1/1866	26/10/1868
Henry Parkes ... ... succeeded by	2	,,	17/9/1868
J. Docker, M.L.C. ...	2	28/9/1868	26/10/1868
Geoffrey Eagar	3	22/1/1866	,,
J. B. Wilson	8	,,	,,
James Byrnes	9	,,	,,
R. M. Isaacs	5	,,	,,
J. Docker, M.L.C. ... succeeded by	10	,,	27/9/1868
A. A. P. Tighe	10	28/9/1868	26/10/1868
J. Docker, M.L.C. ...	16	22/1/1866	,,

XI.—ROBERTSON MINISTRY.

John Robertson	1-2	27/10/1868	Mergedinto Cowper Ministry, 12/1/1870
Saul Samuel	3	,,	,,
William Forster	8	,,	,,
John Sutherland	9	,,	,,
Sir W. M. Manning ...	4	31/10/1868	,,
J. F. Josephson ... ... succeeded by	5	27/10/1868	9/9/1869
J. E. Salomons	5	18/12/1869	12/1/1870
Daniel Egan	10	27/10/1868	,,
R. Owen, M.L.C.	16	,,	,,

XII.—COWPER MINISTRY.

Charles Cowper	1-2-15	13/1/1870	15/12/1870
Saul Samuel	3	,,	,,
William Forster ... ... succeeded by	8	,,	14/4/1870
John Robertson	8	13/8/1870	15/12/1870
John Sutherland	9	13/1/1870	,,
Sir W. M. Manning ...	4	,,	,,
J. E. Salomons, M.L.C. ...	5	,,	,,
Daniel Egan	10	,,	16/10/1870
R. Owen M.L.C. ...	16	,,	1/8/1870
J. E. Salomons, M.L.C. ...	16	11/8/1870	15/12/1870

XIII.—MARTIN MINISTRY.

Sir James Martin ...	1-4	16/12/1870	13/5/1872
John Robertson	2	,,	,,
G. W Lord	3	,,	,,
J. B. Wilson	8	,,	,,
James Byrnes	9	,,	,,
W. C. Windeyer	5	,,	,,
J. Docker, M.L.C. ...	10-16	,,	,,

XIV.—PARKES MINISTRY.

Henry Parkes	1-2	14/5/1872	8/2/1875
W. R. Piddington ... succeeded by	3	,,	4/12/1872
G. A. Lloyd	3	5/12/1872	8/2/1875
J. S Farnell	8	14/5/1872	,,
J. S. Farnell ... ... succeeded by	11	9/5/1874	26/7/1874
R. P. Abbott	11	27/7/1874	8/2/1875
John Sutherland	9	15/5/1872	,,
Edward Butler ... ... succeeded by	4	,,	10/11/1873
J. G. L. Innes, M.L.C. ...	4	20/11/1873	8/2/1875
G. W. Allen	12	9/12/1873	,,
J. G. L. Innes	5	14/5/1872	19/11/1873
G. A. Lloyd ... ... succeeded by	10	,,	4/12/1872
S. Samuel, M.L.C. ...	10-15	5/12/1872	8/2/1875
S. Samuel, M.L.C. ... succeeded by	16	14/5/1872	9/9/1873
J. G. L. Innes, M.L.C. ...	16	9/9/1873	8/2/1875

XV.—ROBERTSON MINISTRY.

John Robertson	1-2	9/2/1875	21/3 1877
William Forster ... ... succeeded by	3	,,	7/2/1876
Alexander Stuart ...	3	8/2/1876	21/3/1877
J. Docker, M.L.C. ...	12-16	9/2/1875	,,
Thomas Garrett ... ... succeeded by	8	,,	5/2/1877
E. A. Baker	8	6/2/1877	21/3/1877
John Lackey	9	9/2/1875	,,
W. B. Dalley, M.L.C. ...	4	,,	,,
John Lucas	11	,,	,,
J. F. Burns	10	,,	,,

XVI.—PARKES MINISTRY.

Henry Parkes	1-2	22/3/1877	16/8/1877
W. R. Piddington ...	3	,,	,,
F. B. Suttor	12	,,	,,
Richard Driver	8	,,	,,
James Hoskins	9	,,	,,
W. C. Windeyer	4	,,	,,
G. A. Lloyd	11	,,	,,
S. Samuel, M.L.C. ...	10-16	,,	,,

XVII.—ROBERTSON MINISTRY.

Name.	Office.	From—	To—
Sir J. Robertson	1-2	17/8/1877	17/12/1877
W. A. Long	3	,,	,,
John Lackey	12	,,	,,
Thomas Garrett	8	,,	19/11/1877
succeeded by			
E. A. Baker	8	20/11/1877	17/12/1877
Edward Combes	9	17/8/1877	,,
W. B. Dalley	4	,,	,,
E. A. Baker	11	,,	19/11/1877
succeeded by			
A. H. Jacob	11	20/11/1877	17/12/1877
John Davies	10	17/8/1877	,,
J. Docker, M.L.C. ...	15-16	,,	,,

XVIII.—FARNELL MINISTRY.

J. S. Farnell	1-8	18/12/1877	20/12/18 7
M. Fitzpatrick	2	,,	,,
H. E. Cohen	3	,,	,,
Joseph Leary	12	,,	,,
John Sutherland	9	,,	,,
W. J. Foster, M.L.C. ...	4	,,	,,
W. H. Suttor	11	,,	,,
J. F. Burns	10	,,	,,
John Marks, M.L.C. ...	15-16	14/1/1878	,,

XIX.—PARKES MINISTRY.

Sir H. Parkes	1-2	21/12/1878	4/1/1883
Sir John Robertson ...	1a,2a	29/12/1881	19/8/1882
James Watson	3	,,	,,
F. B. Suttor	12	,,	30/4/1880
Sir J. Robertson, M.L.C.	15-16	,,	10/11/1881
Sir J. Robertson, M.L.C.	14	1/5/1880	,,
succeeded by			
F. B. Suttor	14	14/11/1881	4/1/1883
F. B. Suttor	13	1/5/1880	10/8/1880
succeeded by			
Sir J. G. L. Innes, M.L.C.	13	11/8/1880	13/10/1881
succeeded by			
W. J. Foster	13	14/10/1881	4/1/1883
W. C. Windeyer	4	21/12/1878	10/8/1879
succeeded by			
Robert Wisdom	4	13/8/1879	4/1/1883
James Hoskins	8	21/12/1878	28/12/1881
succeeded by			
Sir J. Robertson, M.L.C.	8	29/12/1881	4/1/1883
John Lackey	9	21/12/1878	,,
Saul Samuel	10	,,	10/8/1880
succeeded by			
F. B. Suttor	10	11/8/1880	13/11/1881
succeeded by			
S. C. Brown, M.L.C. ...	10	14/11/1881	22/8/1882
succeeded by			
A. Campbell, M.L.C. ...	10	30/8/1882	4/1/1883
E. A. Baker	11	21/12/1878	13/8/1881
succeeded by			
F. B. Suttor (acting) ...	11	30/8/1881	11/10/1881
succeeded by			
Arthur Renwick	11	12/10/1881	4/1/1883
F. M. Darley, M.L.C. ...	15-16	14/11/1881	,,

XX.—STUART MINISTRY.

Alexander Stuart ...	1-2	5/1/1883	6/10/1885
G. R. Dibbs	3	,,	,,
G. H. Reid	14	,,	6/3/1884
succeeded by			
W. J. Trickett	14	2/5/1884	6/10/1885
H. E. Cohen	13	5/1/1883	,,
W. B. Dalley, M.L.C. ...	4-16	,,	,,
J. S. Farnell	8	,,	,,
H. Copeland	9	,,	28/3/1883
succeeded by			
Alexander Stuart (acting)	9	29/3/1883	27/5/1883
succeeded by			
Francis A. Wright ...	9	28/5/1883	6/10/1885
Francis A. Wright ...	10	5/1/1883	27/5/1883
succeeded by			
W. J. Trickett	10	28/5/1883	1/5/1884
succeeded by			
J. Norton, M.L.C. ...	10	2/5/1884	6/10/1885
J. P. Abbott	11	5/1/1883	,,
Sir P. A. Jennings ...	15	,,	31/7/1883

XXI.—DIBBS MINISTRY.

G. R. Dibbs	1	7/10/1885	21/12/1885
G. R. Dibbs	2	,,	9/10/1885
succeeded by			
Sir P. A. Jennings ...	2	10/10/1885	21/12/1885
G. R. Dibbs	3	,,	,,
W. J. Trickett	14	7/10/1885	,,
J. S. Farnell, M.L.C. ...	13-16	,,	9/10/1885
succeeded by			
T. M. Slattery	13	2/11/1885	21/12/1885
John H. Want	4	7/10/1885	,,
J. P. Abbott	8	,,	,,

XXI.—DIBBS MINISTRY (*continued*).

Name.	Office.	From—	To—
Henry S. Badgery ...	9	,,	31/10/1885
succeeded by			
W. J. Lyne	9	2/11/1885	21/12/1885
John See	10	7/10/1885	,,
Francis A. Wright ...	11	,,	17/10/1885
succeeded by			
G. Thornton, M.L.C. ...	11-16	13/11/1885	21/12/1885

XXII.—ROBERTSON MINISTRY.

Sir J. Robertson	1-2	22/12/1885	25/2/1886
J. F. Burns	3	,,	,,
J. H. Young	14	,,	,,
L. F. Heydon	13	,,	4/2/1886
G. B. Simpson, M.L.C. ...	4-16	,,	25/2/1886
Gerald Spring	8	,,	,,
Jacob Garrard	9	,,	,,
Daniel O'Connor	10	,,	,,
R. M. Vaughn	11	,,	,,

XXIII.—JENNINGS MINISTRY.

Sir P. A. Jennings ...	1-3	26/2/1886	19/1/1887
G. R. Dibbs	2	,,	,,
Arthur Renwick	14	,,	,,
J. P. Garvan	13	,,	,,
John H. Want	4	,,	,,
H. Copeland	8	,,	,,
W. J. Lyne	9	,,	,,
F. B. Suttor	10	,,	,,
James Fletcher	11	,,	23/12/1886
succeeded by			
C. K. Mackellar, M.L.C.	11-16	24/12/1886	19/1/1887
C. K. Mackellar, M.L.C. ...	15	26/2/1886	23/12/1886

XXIV.—PARKES MINISTRY.

Sir H. Parkes	1	20/1/1887	16/1/1889
Sir H. Parkes	2	25/1/1887	,,
J. F. Burns	3	20/1/1887	,,
W. J. Foster	4	,,	18/5/1887
succeeded by			
B. R. Wise	4	27/5/1887	7/2/1888
succeeded by			
G. B. Simpson, M.L.C. ...	4	10/2/1888	16/1/1889
Thomas Garrett	8	20/1/1887	19/7/1888
succeeded by			
Sir H. Parkes (acting) ...	8	26/7/1888	28/8/1888
succeeded by			
J. N. Brunker	8	29/8/1888	16/1/1889
John Sutherland	9	20/1/1887	16/1/1889
William Clarke	13	,,	,,
James Inglis	14	,,	,,
F. Abigail	11	,,	,,
C. J. Roberts	10	,,	,,
Sir H. Parkes	15	,,	6/3/1887
succeeded by			
J. E. Salomons, M.L.C. ...	15-16	7/3/1887	16/1/1889

XXV.—DIBBS MINISTRY.

G. R. Dibbs	1-2	17/1/1889	7/3/1889
J. P. Garvan	3	,,	,,
Edmund Barton, M.L.C.	4-16	,,	,,
W. J. Lyne	8	,,	,,
James Fletcher	9	,,	,,
T. M. Slattery	13	,,	,,
F. B. Suttor	14	,,	,,
J. M. Chanter	11	,,	,,
Henry Clarke	10	,,	,,
J. Lackey, M.L.C. ...	15	,,	,,

XXVI.—PARKES MINISTRY.

Sir H. Parkes	1-2	8/3/1889	22/10/1891
W. McMillan	3	,,	27/7/1891
succeeded by			
Bruce Smith	3	14/8/1891	22/10/1891
G. B. Simpson, M.L.C. ...	4	8/3/1889	,,
J. N. Brunker	8	,,	,,
Bruce Smith	9	,,	13/8/1891
succeeded by			
J. H. Young	9	14/8/1891	22/10/1891
A. J. Gould	13	8/3/1889	,,
J. H. Carruthers	14	,,	,,
Sydney Smith	11	,,	,,
Sydney Smith	17	28/2/1890	,,
Daniel O'Connor	10	,,	,,
W. H. Suttor, M.L.C. ...	15-16	30/4/1889	,,

XXVII.—DIBBS MINISTRY.

G. R. Dibbs	1-2	23/10/1891	2/8/18
John See	3	,,	,,
Edmund Barton	4	,,	14/12/1893
succeeded by			
C. G. Heydon	4	15/12/1893	2/8/1894

XXVII.—Dibbs Ministry (*continued*).

Name.	Office.	From—	To—
H. Copeland	8	23/10/1891	,,
W. J. Lyne	9	,,	,,
R. E. O'Connor, M.L.C. ...	5	19/7/1893	13/9/1893
R. E. O'Connor, M.L.C. ...	13	23/10/1891	14/12/1893
F. B. Suttor	14	,,	2/8/1894
T. M. Slattery	18	,,	,,
John Kidd	10	27/10/1891	,,
Sir J. E. Salomons, M.L.C.	15-16	23/10/1891	26/1/1893
succeeded by			
H. N. MacLaurin, M.L.C.	15-16	5/4/1893	2/8/1894

XXVIII.—REID MINISTRY.

George H. Reid	1	3/8/1894	13/9/1899
George H. Reid	3	,,	3/7/1899
succeeded by			
J. H. Carruthers	3	3/7/1899	13/9/1899
George H. Reid	5	21/12/1894	5/3/1895
,, ...	5	19/12/1895	20/4/1896
,, ...	5	22/12/1896	9/2/1897
,, ...	5	27/4/1898	7/10/1898
,, ...	5	3/1/1899	1/5/1899
J. N. Brunker	2	3/8/1894	13/9/1899
G. B. Simpson, M.L.C. ...	4	,,	1/12/1894
succeeded by			
J. H. Want, M.L.C. ...	4	18/12/1894	4/4/1898
succeeded by			
George H. Reid	4	5/4/1898	18/6/1898
succeeded by			
J. H. Want, M.L.C. ...	4	18/6/1898	18/4/1899
succeeded by			
G. H. Reid	4	19/4/1899	13/9/1899
J. H. Carruthers	8	3/8/1894	3/7/1899
succeeded by			
J. H. Young	8	3/7/1899	13/9/1899
J. H. Young	9	3/8/1894	3/7/1899
succeeded by			
Charles A. Lee	9	3/7/1899	13/9/1899
Jacob Garrard	14	3/8/1894	15/8/1898
Jacob Garrard	19	11/3/1895	,,
succeeded by			
J. A. Hogue	14-19	27/8/1898	13/9/1899
A. J. Gould	13	3/8/1894	15/8/1898
succeeded by			
C. A. Lee	13	27/8/1898	3/7/1899
succeeded by			
J. Hughes, M.L.C. ...	13	3/7/1899	13/9/1899
Sydney Smith	18	3/8/1894	15/8/1898
succeeded by			
Joseph Cook	18	27/8/1898	13/9/1899
Joseph Cook	10	3/8/1894	27/8/1898
succeeded by			
Varney Parkes	10	27/8/1898	13/9/1899
W. H. Suttor, M.L.C. ...	15-16	7/8/1894	15/3/1895
succeeded by			
A. Garran, M.L.C. ...	15-16	19/3/1895	18/11/1898
succeeded by			
J. Hughes, M.L.C. ...	15-16	22/11/1898	13/9/1899

XXIX.—LYNE MINISTRY.

W. J. Lyne	1	14/9/1899	Merged in See Ministry, 27/3/1901
W. J. Lyne	3	15/9/1899	20/3/1901
John See	2	14/9/1899	27/3/1901
B. R. Wise	4	,,	,,
T. H. Hassall	8	,,	9/4/1901
E. W. O'Sullivan ...	9	,,	27/3/1901
W. H. Wood	13	,,	9/4/1901
John Perry	14-19	,,	27/3/1901
J. L. Fegan	18	,,	8/4/1901
W. P. Crick	10	,,	28/2/1901
W. J. Lyne	15	,,	15/9/1899
succeeded by			
J. A. K. Mackay, M.L.C.	15-16	15/9/1899	24/4/1900
succeeded by			
F. B. Suttor, M.L.C. ...	15-16	12/6/1900	27/3/1901

XXX.—SEE MINISTRY.

John See	1-2	28/3/1901	14/6/1904
T. Waddell	3	10/4/1901	,,
B. R. Wise, M.L.C. ...	4	28/3/1901	,,
W. P. Crick	8	11/4/1901	,,
E. W. O'Sullivan ...	9	28/3/1901	,,
R. D. Fitzgerald	13	11/4/1901	16/7/1901
succeeded by			
B. R. Wise, M.L.C. ...	13	22/7/1901	14/6/1904
John Perry	14-19	28/3/1901	,,
John Kidd	18	10/4/1901	,,
F. B. Suttor, M.L.C. ...	15-16	28/3/1901	23/5/1903
succeeded by			
J. A. K. Mackay, M.L.C.	15-16	6/6/1903	14/6/1904
James Hayes	27	11/4/1901	,,
W. Bennett	27	16/4/1901	,,
J. L. Fegan	27	24/3/1903	,,

XXXI.—WADDELL MINISTRY.

Name.	Office.	From—	To—
T. Waddell	1-3-13	15/6/1904	29/8/1904
J. C. Gannon	4	,,	,,
John Perry	2	,,	,,
E. W. O'Sullivan ...	8	,,	,,
W. Bennett	9	,,	,,
J. L. Fegan	14-19	,,	,,
John Kidd	18	,,	,,
J. A. K. Mackay M.L.C.	15-16	,,	,,

XXXII.—CARRUTHERS MINISTRY.

J. H. Carruthers	1-3	30/8/1904	1/10/1907
J. A. Hogue	2	,,	13/5/1907
succeeded by			
T. Waddell	2	14/5/1907	1/10/1907
C. G. Wade	4-13	30/8/1904	,,
James Ashton	8	,,	,,
C. A. Lee	9	,,	,,
B. B. O'Conor	14-19	,,	13/5/1907
succeeded by			
J. A. Hogue	14-19	14/5/1907	1/10/1907
S. W. Moore	18	30/8/1904	,,
J. Hughes, M.L.C. ...	15-16	,,	,,
W. T. Dick	27	,,	,,
J. N. Brunker, M.L.C. ...	27	12/6/1905	,,

XXXIII.—WADE MINISTRY.

C. G. Wade	1-4	2/10/1907	20/10/1910
C. G. Wade	13	,,	20/12/1909
succeeded by			
J. Garland, M.L.C. ...	13-5	21/12/1909	20/10/1910
W. H. Wood	2	2/10/1907	,,
T. Waddell	3	,,	,,
S. W. Moore	8	,,	,,
C. A. Lee	9	,,	,,
John Perry	11	,,	21/1/1908
succeeded by			
W. H. Wood	11	22/1/1908	20/10/1910
J. A. Hogue	14	2/10/1907	,,
W. H. Wood	19	,,	21/1/1908
succeeded by			
J. A. Hogue	19	22/1/1908	20/10/1910
John Perry	17	,,	,,
J. Hughes, M.L.C. ...	15-16	2/10/1907	,,
J. Ashton, M.L.C. ...	27	,,	25/6/1909
C. W. Oakes	27	,,	20/10/1910

XXXIV.—McGOWEN MINISTRY.

J. S. T. McGowen ...	1	21/10/1910	29/6/1913
J. S. T. McGowen ...	8	,,	26/11/1911
succeeded by			
John R. Dacey	3	27/11/1911	11/4/1912
succeeded by			
A. C. Carmichael	3	17/4/1912	5/5/1912
succeeded by			
John H. Cann	3	6/5/1912	29/6/1913
Donald Macdonell ...	2	21/10/1910	26/10/1911
succeeded by			
F. Flowers, M.L.C ...	2	7/11/1911	26/11/1911
succeeded by			
J. S. T. McGowen ...	2	27/11/1911	29/6/1913
W. A. Holman	4	21/10/1910	,,
W. A. Holman	13	,,	1/4/1912
succeeded by			
D. R. Hall, M.L.C. ...	13	2/4/1912	29/6/1913
Donald Macdonell ...	17	21/10/1910	10/9/1911
succeeded by			
John L. Treflé ...	17	7/11/1911	29/6/1913
N. R. W. Nielsen ...	8	21/10/1910	1/8/1911
succeeded by			
F. Flowers, M.L.C. ...	8	4/8/1911	26/11/1911
succeeded by			
G. S. Beeby	8	11/9/1911	9/12/1912
succeeded by			
John L. Treflé	8	10/12/1912	29/6/1913
Arthur Griffith	9	21/10/1910	,,
G. S. Beeby	14	,,	10/9/1911
succeeded by			
A. C. Carmichael ...	14	11/9/1911	26/11/1911
succeeded by			
F. Flowers, M.L.C. ...	14	27/11/1911	29/2/1912
succeeded by			
A. C. Carmichael	14	1/3/1912	29/6/1913
G. S. Beeby	19	21/10/1910	10/9/1911
succeeded by			
A. C. Carmichael	19	11/9/1911	26/11/1911
succeeded by			
G. S. Beeby	19	27/11/1911	9/12/1912
succeeded by			
A. C. Carmichael	19	10/12/1912	29/6/1913
Alfred Edden	11	21/10/1910	,,
F. Flowers, M.L.C. ...	15-16	,,	,,
A. C. Carmichael	27	,,	10/9/1911
John L. Treflé	27	,,	6/11/1911
John L. Treflé	17a	11/9/1911	6/11/1911
John R. Dacey	27	10/11/1911	26/11/1911

XXXV.—HOLMAN MINISTRY.

Name.	Office.	From—	To—
W. A. Holman	1	30/6/1913	15/11/1916
W. A. Holman	2	,,	29/1/1914
succeeded by			
John H. Cann	2	29/1/1914	15/3/1915
succeeded by			
George Black	2	15/3/1915	15/11/1916
John H. Cann	3	30/6/1913	29/1/1914
succeeded by			
W. A. Holman	3	29/1/1914	15/11/1916
W. A. Holman	4	30/6/1913	29/1/1914
succeeded by			
D. R. Hall...	4	29/1/1914	15/11/1916
J. L. Treflé	8	30/6/1913	11/1/1915
succeeded by			
W. G. Ashford	8	12/1/1915	15/11/1916
Arthur Griffith	9	30/6/1913	15/3/1915
succeeded by			
John H. Cann	9	15/3/1915	15/11/1916
Alfred Edden	11	30/6/1913	29/1/1914
succeeded by			
John H. Cann	11	29/1/1914	15/3/1915
succeeded by			
John Estell	11	15/3/1915	31/10/1916
succeeded by			
H. C. Hoyle	11–19	31/10/1916	15/11/1916
David R. Hall	13	30/6/1913	,,
A. C. Carmichael	14	,,	5/3/1915
succeeded by			
W. A. Holman	14	6/3/1915	15/3/1915
succeeded by			
Arthur Griffith	14	15/3/1915	7/11/1916
John L. Treflé	17	30/6/1913	29/1/1914
succeeded by			
W. G. Ashford	17	29/1/1914	23/2/1915
succeeded by			
George Black	17	23/2/1915	15/3/1915
succeeded by			
W. G. Ashford	17	15/3/1915	1/6/1915
succeeded by			
W. C. Grahame	17	1/6/1915	15/11/1916
J. S. T. McGowen ...	19	30/6/1913	29/1/1914
succeeded by			
John Estell	19	29/1/1914	31/10/1916
F. Flowers, M.L.C. ...	20	22/4/1914	27/4/1915
succeeded by			
George Black	20	27/4/1915	15/11/1916
F. Flowers, M.L.C. ...	15-16	30/6/1913	27/4/1915
succeeded by			
J. D. Fitzgerald, M.L.C.	15-16	27/4/1915	15/11/1916
H. C. Hoyle	3a	29/1/1914	31/10/1916
W. C. Grahame	27	15/3/1915	1/6/1915

XXXVI.—NATIONAL MINISTRY.

W. A. Holman	1	15/11/1916	12/4/1920
W. A. Holman	3	,,	30/10/1918
succeeded by			
J. C. L. Fitzpatrick ...	3	30/10/1918	12/4/1920
G. W. Fuller	2	15/11/1916	,,
David R. Hall	4	,,	23/7/1919
succeeded by			
J. Garland, M.L.C. ...	4	23/7/1919	12/4/1920
J. Garland, M.L.C. ...	5-13	15/11/1916	23/7/1919
succeeded by			
J. D. Fitzgerald, M.L.C.	5-13	23/7/1919	12/4/1920
W. G. Ashford	8-21	15/11/1916	,,
R. T. Ball	9-22	,,	,,
J. C. L. Fitzpatrick ...	11	,,	,,
W. C. Grahame	17	,,	14/1/1920
succeeded by			
W. G. Ashford	17	9/2/1920	12/4/1920
W. C. Grahame	19a	30/10/1918	9/6/1919
A. G. F. James	14	15/11/1916	12/4/1920
G. S. Beeby	19	,,	13/7/1919
succeeded by			
A. G. F. James	19	23/7/1919	12/4/1920
J. D. Fitzgerald, M.L.C.	20	15/11/1916	18/7/1919
succeeded by			
David Storey	20	18/7/1919	29/1/1920
succeeded by			
A. Bruntnell	20	9/2/1920	12/4/1920
J. D. Fitzgerald, M.L.C.	23	15/11/1916	,,
David R. Hall	24	23/7/1919	9/2/1920
succeeded by			
C. W. Oakes	24	9/2/1920	12/4/1920
J. D. Fitzgerald, M.L.C.	15	15/11/1916	6/8/1919
succeeded by			
David R. Hall	15	6/8/1919	9/2/1920
succeeded by			
Sir G. W. Fuller	15	9/2/1920	27/2/1920
J. D. Fitzgerald, M.L.C.	16	15/11/1916	12/6/1918
succeeded by			
J. Garland, M.L.C. ...	16	12/6/1918	12/4/1920
David Storey	27	15/11/1916	18/7/1919
David Storey	20a	11/7/1917	3/12/1917
C. W. Oakes	27	18/7/1919	9/2/1920
John T. Crane	8b	9/2/1920	12/4/1920
A. H. Grimm	17b	9/2/1920	12/4/1920

XXXVII.—STOREY MINISTRY.

Name.	Office.	From—	To—
John Storey	1	13/4/1920	5/10/1921
James Dooley	2-24	,,	10/10/1921
John T. Lang	3	,,	,,
E. A. McTiernan	4	,,	,,
P. F. Loughlin	8-21	,,	,,
John Estell	9-22	,,	,,
George Cann	11-19	,,	,,
W. F. Dunn	17	,,	,,
E. A. McTiernan	13	,,	21/12/1920
succeeded by			
W. J. McKell	13	22/12/1920	10/10/1921
T. D. Mutch	14-23	13/4/1920	,,
J. J. G. McGirr	20-25	,,	,,
R. Sproule, M.L.C. ...	5	15/4/1920	,,
E. J. Kavanagh, M.L.C.	15-16	21/4/1920	,,
W. J. McKell	13b	13/4/1920	21/12/1920

XXXVIII.—DOOLEY MINISTRY.

James Dooley	1-2	10/10/1921	20/12/1921
John T. Lang	3	,,	,,
E. A. McTiernan	4	,,	,,
P. F. Loughlin	8-21	,,	,,
John Estell	9-22	,,	,,
W. J. McKell	13	,,	,,
T. D. Mutch	14	,,	,,
George Cann	11-23	,,	,,
R. Sproule, M.L.C. ...	5	,,	,,
W. F. Dunn	17	,,	,,
J. J. G. McGirr	19-20-25	,,	,,
C. C. Lazzarini	26	,,	,,
E. J. Kavanagh, M.L.C.	15-16	,,	,,

XXXIX.—FULLER MINISTRY.

Sir G. W. Fuller ...	1	20/12/1921	20/12/1921
C. W. Oakes	2-20	,,	,,
A. A. C. Cocks	3	,,	,,
T. R. Bavin	4-13	,,	,,
W. E. Wearne	8-21	,,	,,
Sir T. Henley	9-22-24	,,	,,
Thomas J. Ley	14-19	,,	,,
J. C. L. Fitzpatrick ...	11-23	,,	,,
F. A. Chaffey	17	,,	,,
R. Perdriau	26	,,	,,
Sir J.H.Carruthers, M.L.C.	15-16	,,	,,

XL.—DOOLEY MINISTRY.

James Dooley	1-2	20/12/1921	13/4/1922
John T. Lang	3	,,	,,
E. A. McTiernan	4	,,	,,
P. F. Loughlin	8-21	,,	,,
John Estell	9-22	,,	,,
W. J. McKell	13	,,	,,
T. D. Mutch	14	,,	,,
George Cann	11-23	,,	,,
R. Sproule, M.L.C. ...	5	,,	,,
W. F. Dunn	17	,,	,,
E. J. Kavanagh, M.L.C.	15-16-19	,,	,,
J. J. G. McGirr	20-25	,,	,,
C. C. Lazzarini	26	,,	,,

XLI.—COALITION MINISTRY.

Sir G. W. Fuller	1	13/4/1922	17/6/1925
C. W. Oakes	2-20	,,	,,
A. A. C. Cocks	3	,,	14/2/1925
succeeded by			
Sir G. W. Fuller	3	24/2/1925	17/6/1925
T. R. Bavin	4	13/4/1922	,,
W. E. Wearne	8-21	,,	,,
Sir T. Henley	9-22-26	,,	19/6/1922
succeeded by			
R. T. Ball	9-22-26	28/6/1922	17/6/1925
T. J. Ley	13	13/4/1922	,,
A. Bruntnell	14	,,	,,
J. C. L. Fitzpatrick ...	11-23	,,	,,
R. T. Ball	17	,,	28/6/1922
succeeded by			
F. A. Chaffey	17	28/6/1922	17/6/1925
E. H. Farrar, M.L.C. ...	19	13/4/1922	,,
Sir J.H.Carruthers, M.L.C.	15-16	,,	,,
F. A. Chaffey	8b	,,	28/6/1922
F. S. Boyce, M.L.C. ...	27	4/3/1924	17/6/1925

XLII.—LANG MINISTRY.

John T. Lang	1-3	17/6/1925	
John T. Lang	17a	26/3/1926	
P. F. Loughlin	8-21	17/6/1925	
J. M. Baddeley	11-19	,,	
E. A. McTiernan	4	,,	
W. F. Dunn...	17	,,	
W. J. McKell	13-3b	,,	
T. D. Mutch	14	,,	
C. C. Lazzarini	2	,,	
George Cann	20	,,	
M. M. Flannery	9-22	,,	
A. C. Willis, M.L.C. ...	15–16	,,	
J. J. Fitzgerald	20b-23b	,,	25/3/1926
George Cann	23	,,	,,
succeeded by			
J. J. Fitzgerald	23	25/3/1926	
J. F. Coates, M.L.C. ...	27	17/6/1925	

VICTORIA.

KEY TO OFFICE.

1. Premier.
2. Chief Secretary.
3. Treasurer.
4. Attorney-general.
5. Solicitor-general.
6. President of the Board of Land and Works and Commissioner of Crown Lands and Survey.
7. President of the Board of Land and Works.
8. Minister of Lands.
9. Minister of Public Works (sometimes called Commissioner).
10. Postmaster-general.
11. Minister of Mines (sometimes called Commissioner).
12. Surveyor-general.
13. Minister of Justice.
14. Minister of Public Instruction.
15. Vice-president of the Board of Land and Works and Commissioner of Public Works.
16. Vice-president of the Board of Land and Works and Commissioner of Railways and Roads.
17. Minister of Agriculture.
18. Minister of Water-supply (sometimes called Commissioner).
19. Minister of Defence.
20. Minister of Health.
21. Minister of Forests.
22. Minister of Railways (sometimes called Commissioner).
23. Commissioner of Railways and Roads.
24. Commissioner of Trade and Customs.
25. Commissioner of Crown Lands and Survey.
26. Vice-president of the Board of Land and Works.
27. Minister of Labour (also called Labour and Industry).
28. Minister of Immigration.
29. Minister of Markets.
30. Minister without Portfolio.

I.—HAINES MINISTRY.

Name.	Office.	From—	To—
W. C. Haines	1-2	28/11/1855	11/3/1857
W. F. Stawell	4	,,	25/2/1857
succeeded by			
T. H. Fellows	4	25/2/1857	11/3/1857
Charles Sladen	3	28/11/1855	,,
Charles Pasley	9	,,	,,
H. C. E. Childers ...	24	,,	25/2/1857
succeeded by			
John Goodman	24	25/2/1857	11/3/1857
Andrew Clarke	12	28/11/1855	,,
Robert Molesworth ...	5	,,	17/6/1856
succeeded by			
T. H. Fellows	5	27/6/1856	25/2/1857
succeeded by			
R. S. W. Sitwell	5	25/2/1857	11/3/1857
W. H. F. Mitchell, M.L.C.	30	28/11/1855	,,

II.—O'SHANASSY MINISTRY.

John O'Shanassy ...	1-2	11/3/1857	29/4/1857
H. S. Chapman	4	,,	,,
J. V. F. Foster	3	,,	,,
C. G. Duffy	9	,,	,,
A. F. A. Greeves	24	,,	,,
G. S. W. Horne	25	,,	,,
John D. Wood	5	,,	,,

III.—HAINES MINISTRY.

W. C. Haines	1-2	29/4/1857	10/3/1858
A. Michie	4	,,	,,
C. H. Ebden	3	,,	,,
David Moore	7	,,	,,
James McCulloch ...	24	,,	,,
T. H. Fellows	5	,,	,,
W. H. F. Mitchell ...	10	,,	,,
J. F. Strachan, M.L.C. ...	30	,,	,,

IV.—O'SHANASSY MINISTRY.

Name.	Office.	From—	To—
John O'Shanassy ...	1-2	10/3/1858	27/10/1859
H. S. Chapman	4	,,	,,
George Harker	3	,,	,,
C. G. Duffy	7	,,	22/3/1859
C. G. Duffy	25	21/12/1858	,,
succeeded by			
G. S. Evans	7-25	22/3/1859	27/10/1859
Henry Miller	24	10/3/1858	,,
R. D. Ireland	5	,,	,,
G. S. Evans	10	,,	,,
G. S. W. Horne	9	21/12/1858	,,
T. McCombie, M.L.C. ...	30	10/3/1858	,,

V.—NICHOLSON MINISTRY.

W. Nicholson	1-2	27/10/1859	26/11/1860
J. D. Wood	4	,,	,,
James McCulloch ...	3	,,	,,
James Service	6	,,	3/9/1860
succeeded by			
Vincent Pyke	6	3/9/1860	24/9/1860
succeeded by			
A. F. A. Greeves	6	24/9/1860	26/11/1860
John C. King	15	27/10/1859	25/11/1859
succeeded by			
J. G. Francis	15	25/11/1859	3/9/1860
succeeded by			
John R. Bailey	15	3/9/1860	2/10/1860
succeeded by			
Vincent Pyke	15	2/10/1860	26/11/1860
Vincent Pyke	24	27/10/1859	29/10/1860
succeeded by			
J. R. Bailey	24	29/10/1860	26/11/1860
T. Adamson	5	27/10/1859	5/3/1860
succeeded by			
J. F. Martley	5	5/3/1860	26/11/1860
J. R. Bailey	10	27/10/1859	29/10/1860
succeeded by			
Hibbert Newton	10	29/10/1860	26/11/1860
T. H. Fellows, M.L.C. ...	30	27/10/1859	,,

VI.—HEALES MINISTRY.

Richard Heales	1-2	26/11/1860	14/11/1861
R. D. Ireland	4	,,	29/7/1861
succeeded by			
B. C. Aspinall	4	29/7/1861	14/11/1861
G. F. Verdon	3	26/11/1860	,,
J. H. Brooke	6	,,	,,
J. S. Johnston	15	,,	20/2/1861
succeeded by			
J. M. Grant	15	20/2/1861	14/11/1861
R. S. Anderson	24	26/11/1860	20/2/1861
succeeded by			
George Brodie	24	20/2/1861	4/3/1861
succeeded by			
Thomas Loader	24	6/3/1861	10/6/1861
succeeded by			
J. F. Sullivan	24	10/6/1861	14/11/1861
Thomas Loader	22	26/11/1860	4/12/1860
succeeded by			
John Houston	22	21/5/1861	14/11/1861
J. B. Humffray	11	26/11/1860	,,
Thomas Loader	10	4/12/1860	21/3/1861
succeeded by			
John Macadam	10	26/4/1861	14/11/1861
T. T. a'Beckett, M.L.C. ...	30	26/11/1860	11/11/1861
D. E. Wilkie, M.L.C. ...	30	,,	,,

VII.—O'SHANASSY MINISTRY.

John O'Shanassy ...	1-2	14/11/1861	27/6/1863
W. C. Haines	3	,,	,,
R. D. Ireland	4	,,	,,
J. D. Wood	13	,,	,,
C. G. Duffy	6	,,	,,
J. S. Johnston	15	,,	,,
R. S. Anderson	24	,,	,,
G. S. Evans	10	30/12/1861	,,
W. H. F. Mitchell, M.L.C.	23	,,	,,
Charles MacMahon ...	30	14/11/1861	,,

VIII.—McCULLOCH MINISTRY.

James McCulloch ...	1-2	27/6/1863	6/5/1868
George Higinbotham ...	4	,,	,,
G. F. Verdon	3	,,	5/5/1868
Richard Heales	6	,,	19/6/1864
J. M. Grant	6	5/9/1864	6/5/1868
Matthew Hervey	15	27/6/1863	22/7/1865
W. M. K. Vale	15	18/7/1866	6/5/1868
J. G. Francis	24	27/6/1863	,,
J. F. Sullivan	11	,,	18/7/1866
succeeded by			
John Macgregor	11	18/7/1866	6/5/1868
J. M. Grant	16	27/6/1863	5/9/1864

VIII.—McCULLOCH MINISTRY (*continued*).

Name.	Office.	From—	To—
Henry Miller	16	18/7/1866	16/1/1867
succeeded by			
John Macgregor	16	21/1/1867	4/3/1867
succeeded by			
J. F. Sullivan	16	4/3/1867	6/5/1868
Archibald Michie ...	13	14/7/1863	18/7/1866
succeeded by			
S. H. Bindon	13	18/7/1866	6/5/1868
T. H. Fellows	10	14/10/1863	24/3/1864
James McCulloch ...	10	9/5/1864	6/5/1868
G. W. Cole, M.L.C. ...	30	27/6/1863	,,

IX.—SLADEN MINISTRY.

C. Sladen, M.L.C.... ...	1-2	6/5/1868	11/7/1868
T. H. Fellows	18	,,	,,
M. A. MacDonnell ...	4	,,	,,
Edward Langton ...	3	,,	,,
Duncan Gillies	6	,,	,,
Michael O'Grady	15	,,	,,
William Bayles	24	,,	,,
G. B. Kerferd	11-26	8/5/1868	,,

X.—McCULLOCH MINISTRY.

James McCulloch ...	1-2-3	11/7/1868	20/9/1869
G. P. Smith	4	,,	,,
J. J. Casey	13	,,	,,
J. J. Casey	5	2/9/1869	,,
J. M. Grant	6	11/7/1868	,,
J. F. Sullivan	11	,,	,,
George Higinbotham ...	26	,,	1/2/1869
succeeded by			
J. F. Sullivan	26	1/2/1869	20/9/1869
C. E. Jones	26	3/8/1868	9/3/1869
W. M. K. Vale	24	11/7/1868	25/5/1869
George Rolfe	24	2/9/1869	20/9/1869
C. E. Jones	23	11/7/1868	9/3/1869
succeeded by			
J. F. Sullivan	23	12/4/1869	2/9/1869
succeeded by			
William Wilson	23	2/9/1869	20/9/1869
G. V. Smith	10	11/7/1868	,,
J. McCrae, M.L.C. ...	9	25/1/1869	,,

XI.—MacPHERSON MINISTRY.

J. A. MacPherson ...	1-2	20/9/1869	9/4/1870
Robert Byrne	3	,,	21/1/1870
succeeded by			
Graham Berry	3	21/1/1870	9/4/1870
M. A. MacDonnell ...	4	20/9/1869	,,
James McKean	6	,,	,,
I. G. Reeves	9	,,	19/1/1870
succeeded by			
William McLellan ...	9	19/1/1870	9/4/1870
William McLellan ...	26	10/2/1870	9/4/1870
Edward Cohen	24	20/9/1869	,,
J. T. Smith	11	,,	,,
F. Longmore	23	,,	,,
B. C. Aspinall	5	19/1/1870	,,
C. J. Jenner, M.L.C. ...	30	20/9/1869	,,

XII.—McCULLOCH MINISTRY.

James McCulloch ...	1-2	9/4/1870	19/6/1871
Archibald Michie ...	4	,,	,,
J. G. Francis	3	,,	,,
T. T. a'Beckett, M.L.C. ...	24	,,	,,
William Wilson	23	,,	,,
J. A. MacPherson ...	6	,,	,,
H. J. Wrixon	5	,,	,,
William Bates	9-26	,,	,,
Angus Mackay	11	,,	,,

XIII.—DUFFY MINISTRY.

C. G. Duffy	1-2	19/6/1871	10/6/1872
J. M. Grant	6	,,	,,
Graham Berry	3	,,	21/5/1872
Michael O'Grady	15	,,	10/6/1872
Francis Longmore ...	16	,,	,,
William McLellan ...	11	,,	,,
Howard Spensley ...	5	,,	,,
Graham Berry	24	,,	23/11/1871
succeeded by			
W. M. K. Vale	24	23/11/1871	10/6/1872
Robert Walsh	4	5/7/1871	,,
W. A. C. a'Beckett, M.L.C.	30	19/6/1871	,,
C. J. Jenner, M.L.C. ...	30	,,	,,

XIV.—FRANCIS MINISTRY.

J. G. Francis	1-2	10/6/1872	31/7/1874
Edward Langton ...	3-10	,,	,,
J. J. Casey	6	,,	,,
J. W. Stephen	4	,,	1/5/1874
succeeded by			
G. B. Kerferd	4	2/5/1874	31/7/1874
Duncan Gillies	23-26	10/6/1872	,,

XIV.—FRANCIS MINISTRY (*continued*).

Name.	Office.	From—	To—
G. B. Kerferd	5	,,	,,
Edward Cohen	24	,,	,,
Angus Mackay	11	,,	,,
A. Fraser, M.L.C.... ...	9	14/6/1872	4/5/1874
A. Fraser, M.L.C.... ...	26	17/6/1872	,,
succeeded by			
R. S. Anderson, M.L.C. ...	9-26	4/5/1874	31/7/1874
J. J. Casey	17	19/6/1872	,,
J. W. Stephen	14	2/1/1873	1/5/1874
succeeded by			
Angus Mackay	14	4/5/1874	31/7/1874
Robert Ramsay	30	10/6/1872	,,

XV.—KERFERD MINISTRY.

G. B. Kerferd	1-4	31/7/1874	7/8/1875
J. J. Casey	7-17-25	,,	,,
Duncan Gillies	16	,,	,,
R. S. Anderson, M.L.C. ...	15	,,	,,
Edward Cohen	24	,,	,,
Angus Mackay	11-14	,,	,,
James Service	3	,,	,,
Robert Ramsay	10	,,	,,
T. MacDermott	5	,,	,,

XVI.—BERRY MINISTRY.

Graham Berry	1-3	7/8/1875	20/10/1875
Graham Berry	2	10/8/1875	,,
James Munro	14	7/8/1875	,,
Francis Longmore ...	6	,,	,,
Francis Longmore ...	17	23/8/1875	,,
John Woods	23	7/8/1875	,,
John Woods	26	23/8/1875	,,
W. C. Smith	11	7/8/1875	,,
Peter Lalor	24-10	,,	,,
J. B. Patterson	9	,,	,,
J. B. Patterson	26	23/8/1875	,,
R. Le Poer Trench ...	4	9/8/1875	,,
J. M. Grant	13	,,	,,
W. A. C. a'Beckett, M.L.C.	30	7/8/1875	,,

XVII.—McCULLOCH MINISTRY.

Sir James McCulloch ...	1-3	20/10/1875	21/5/1877
J. A. MacPherson ...	2	,,	,,
G. B. Kerferd	4	,,	,,
Duncan Gillies	6	,,	,,
Duncan Gillies	17	25/10/1875	,,
Robert Ramsay	14-10	20/10/1875	,,
R. S. Anderson, M.L.C. ...	24	,,	,,
John Madden	13	,,	,,
William McLellan ...	11	,,	,,
Joseph Jones	15-23	,,	,,

XVIII.—BERRY MINISTRY.

Grahan Berry	1-2	21/5/1877	5/3/1880
Graham Berry	3	,,	27/12/1878
succeeded by			
W. C. Smith	3	27/12/1878	3/11/1879
succeeded by			
Graham Berry	3	3/11/1879	5/3/1880
Francis Longmore ...	6	21/5/1877	,,
Francis Longmore ...	17	28/5/1877	,,
W. C. Smith	11-14	21/5/1877	,,
J. B. Patterson	9	,,	,,
J. B. Patterson	26	28/5/1877	,,
R. Le Poer Trench ...	4	22/5/1877	27/3/1878
succeeded by			
Sir Bryan O'Loghlen ...	4	27/3/1878	5/3/1880
J. M. Grant	13	22/5/1877	,,
Peter Lalor	24	,,	,,
John Woods	23	,,	,,
John Woods	26	11/6/1877	,,
Peter Lalor	10	22/5/1877	3/7/1877
succeeded by			
H. Cuthbert, M.L.C. ...	10	3/7/1877	29/7/1878
succeeded by			
J. B. Patterson	10	29/7/1878	5/3/1880

XIX.—SERVICE MINISTRY.

James Service	1-3	5/3/1880	3/8/1880
Robert Ramsay	2-14	,,	,,
G. B. Kerferd	4	,,	,,
John Madden	13	,,	,,
Duncan Gillies	22	,,	,,
J. G. Duffy	6	,,	,,
Thomas Bent	9	,,	,,
Robert Clark	11	,,	,,
H. Cuthbert, M.L.C. ...	24-10	,,	,,
Duncan Gillies	26	16/3/1880	,,
Thomas Bent	26	,,	,,
J. G. Duffy	17	19/3/1880	,,
Robert Clark	18	2/4/1880	,,
J. G. Francis	30	5/3/1880	,,
R. S. Anderson, M.L.C. ...	30	,,	,,

XX.—BERRY MINISTRY.

Name.	Office.	From—	To—
Graham Berry	1-2-3	3/8/1880	9/7/1881
W. M. K. Vale	4-13	,,	,,
R. Richardson	6	,,	,,
J. B. Patterson	22	,,	,,
W. C. Smith	14	,,	,,
A. T. Clark	24	,,	,,
H. R. Williams	11	,,	,,
G. D. Langridge	9	,,	,,
R. Richardson	17	12/8/1880	,,
G. D. Langridge	26	,,	,,
J. B. Patterson	26	,,	,,
C. H. Pearson	30	3/8/1880	,,
R. D. Reid	30	5/8/1880	,,

XXI.—O'LOGHLEN MINISTRY.

Sir Bryan O'Loghlen ...	1-4	9/7/1881	8/3/1883
J. M. Grant	2	,,	,,
Thomas Bent	22	,,	,,
F. S. Dobson, M.L.C. ...	5	,,	,,
J. H. Graves	24	,,	,,
Charles Young	17-18	,,	,,
Henry Bolton	10	,,	,,
David Gaunson	6	,,	2/8/1881
succeeded by			
Walter Madden	6	19/8/1881	8/3/1883
Sir Bryan O'Loghlen ...	3	9/7/1881	,,
J. M. Grant	14	,,	,,
Thomas Bent	26	,,	,,
Charles Young	11	,,	19/8/1881
succeeded by			
Robert Burrowes ...	11	19/8/1881	8/3/1883
Charles Young	15	,,	,,
L. L. Smith	30	9/7/1881	,,
J. MacBain, M.L.C. ...	30	19/8/1881	,,

XXII.—SERVICE MINISTRY.

James Service	1-3	8/3/1883	18/2/1886
Graham Berry	2	,,	16/2/1886
G. B. Kerferd	4	,,	1/1/1886
R. S. Anderson, M.L.C. ...	13	,,	26/10/1883
Duncan Gillies	22-14	,,	18/2/1886
G. D. Langridge	24	,,	,,
A. L. Tucker	6	,,	,,
J. F. Levien	11-17	,,	,,
F. T. Sargood	18-19	13/11/1883	,,
Alfred Deakin	5-9	,,	,,
James Campbell	10	10/4/1884	,,
Nathan Thornley ...	30	,,	,,

XXIII.—GILLIES MINISTRY.

Duncan Gillies	1-3-22	18/2/1886	5/11/1890
Alfred Deakin	2-18	,,	,,
Alfred Deakin	20	29/1/1890	,,
Alfred Deakin	5	1/9/1890	,,
H. J. Wrixon	4	18/2/1886	,,
J. L. Dow	11	,,	24/8/1886
succeeded by			
Duncan Gillies	11	24/8/1886	17/6/1890
succeeded by			
D. M. Davies	11	17/6/1890	5/11/1890
H. Cuthbert, M.L.C. ...	13	18/2/1886	,,
Sir J. Lorimer, M.L.C. ...	19	,,	16/9/1889
succeeded by			
J. Bell, M.L.C.	19	16/9/1889	5/11/1890
C. H. Pearson	14	18/2/1886	,,
John L. Dow	6	,,	21/5/1890
John L. Dow	6	1/9/1890	5/11/1890
John L. Dow	17	18/2/1886	,,
John L. Dow	11	,,	24/8/1886
W. F. Walker	24	,,	5/3/1889
succeeded by			
Henry Cuthbert	24	5/3/1889	16/4/1889
succeeded by			
J. B. Patterson	24	16/4/1889	5/11/1890
John Nimmo	9	18/2/1886	1/6/1889
John Nimmo	26	23/2/1886	,,
D. M. Davies	15	1/6/1889	17/6/1890
succeeded by			
J. B. Patterson	15	17/6/1890	2/9/1890
succeeded by			
W. Anderson	15	2/9/1890	5/11/1890
F. T. Derham	10	20/2/1886	18/8/1890
succeeded by			
J. B. Patterson	10	2/9/1890	5/11/1890
M. H. Davies	30	20/2/1886	4/10/1887
D. M. Davies	30	28/10/1887	1/6/1889
J. Bell, M.L.C.	30	20/4/1886	16/9/1889
J. Balfour, M.L.C. ...	30	15/5/1890	5/11/1890

XXIV.—MUNRO MINISTRY.

James Munro	1-3	5/11/1890	Merged in Shiels Ministry, 16/2/1892

XXIV.—MUNRO MINISTRY (*continued*).

Name.	Office.	From—	To—
G. D. Langridge	2	,,	24/3/1891
succeeded by			
J. M. Davies, M.L.C. ...	2	26/3/1891	22/4/1891
succeeded by			
Allan McLean	2	22/4/1891	16/2/1892
G. D. Langridge	20	5/11/1890	24/3/1891
succeeded by			
J. M. Davies, M.L.C. ...	20	26/3/1891	22/4/1891
succeeded by			
George Turner	20	22/4/1891	16/2/1892
G. D. Langridge	24	5/11/1890	24/3/1891
succeeded by			
J. H. Wheeler	24	26/3/1891	22/4/1891
succeeded by			
George Turner	24	22/4/1891	16/2/1892
William Shiels	4-22	5/11/1890	,,
Sir F. T. Sargood, M.L.C.	14-19	,,	,,
J. M. Davies, M.L.C. ...	13	,,	,,
Allan McLean	6	,,	,,
Allan McLean	17	,,	22/4/1891
succeeded by			
George Graham	17	22/4/1891	16/2/1892
J. H. Wheeler	15	5/11/1890	,,
A. R. Outtrim	11	,,	,,
A. R. Outtrim	26	28/4/1891	,,
George Graham	18	5/11/1890	,,
J. G. Duffy	10	,,	,,
Frank Stuart	30	,,	21/4/1891
A. J. Peacock	30	,,	11/2/1892
S. Fraser, M.L.C. ...	30	,,	16/2/1892
C. J. Ham, M.L.C. ...	30	,,	,,

XXV.—SHIELS MINISTRY.

William Shiels	1	16/2/1892	23/1/1893
Allan McLean	2-6	,,	,,
William Shiels	3	,,	28/4/1892
succeeded by			
Sir Graham Berry ...	3	28/4/1892	23/1/1893
J. G. Duffy	4	16/2/1892	28/4/1892
succeeded by			
William Shiels	4	28/4/1892	23/1/1893
J. H. Wheeler	22	16/2/1892	,,
A. R. Outtrim	11-26	,,	,,
A. R. Outtrim	19	,,	28/4/1892
succeeded by			
G. Davis, M.L.C.	19	28/4/1892	23/1/1893
George Graham	15-17-18	16/2/1892	,,
George Turner	5-20-24	,,	,,
A. J. Peacock	14	,,	,,
J. G. Duffy	10	,,	28/4/1892
succeeded by			
W. A. Zeal, M.L.C. ...	10	28/4/1892	8/11/1892
succeeded by			
A. J. Peacock	10	15/11/1892	23/1/1893
G. Davis, M.L.C.	30	16/2/1892	28/4/1892
J. G. Duffy	30	26/5/1892	23/1/1893
Frederick Brown	30	27/6/1892	,,

XXVI.—PATTERSON MINISTRY.

J. B. Patterson	1-2	23/1/1893	27/9/1894
G. D. Carter	3	,,	,,
Sir B. O'Loghlen	4	,,	,,
I. A. Isaacs	5	,,	25/5/1893
succeeded by			
A. Wynne, M.L.C. ...	5	25/5/1893	27/9/1894
James Campbell	14-24	23/1/1893	16/9/1893
succeeded by			
Richard Baker	14-24	26/9/1893	27/9/1894
James McIntyre	6	23/1/1893	,,
R. Reid, M.L.C.	19	,,	,,
J. H. McColl	11-18	,,	,,
W. T. Webb	15-17	,,	,,
J. B. Patterson	22	,,	14/8/1893
succeeded by			
Richard Richardson ...	22	14/8/1893	27/9/1894
A. Wynne, M.L.C. ...	10	23/1/1893	,,
Richard Richardson ...	30	,,	14/8/1893
J. H. Abbott, M.L.C. ...	30	,,	27/9/1894

XXVII.—TURNER MINISTRY.

George Turner	1-3	27/9/1894	1/12/1899
A. J. Peacock	2-14	,,	,,
I. A. Isaacs	4	,,	,,
Sir F. T. Sargood, M.L.C.	19-26	,,	20/12/1894
succeeded by			
George Turner	19-26	20/12/1894	13/2/1895
succeeded by			
W. McCulloch, M.L.C. ...	19-26	13/2/1895	1/12/1899
R. W. Best	6-24	27/9/1894	,,
H. Cuthbert, M.L.C. ...	5	,,	,,
H. Cuthbert, M.L.C. ...	20	,,	14/5/1895
succeeded by			
J. W. Taverner	20	14/5/1895	16/9/1895
succeeded by			
H. R. Williams	20	16/9/1895	1/12/1899
H. R. Williams	22-24	27/9/1894	,,

XXVII.—TURNER MINISTRY (*continued*).

Name.	Office.	From—	To—
J. W. Taverner ...	9-17	,,	,,
J. W. Taverner	26	28/12/1894	,,
Henry Foster	11-18	28/9/1894	,,
J. G. Duffy	10	27/9/1894	,,
W. McCulloch, M.L.C. ...	30	,,	13/2/1895
R. T. Vale	30	28/9/1894	6/8/1896
Allan McLean	30	,,	20/4/1898
I. M. Pratt, M.L.C. ...	30	2/10/1894	20/12/1894
D. Coutts, M.L.C. ..	30	14/3/1895	2/5/1897
S. Williamson, M.L.C. ...	30	,,	1/12/1899

XXVIII.—McLEAN MINISTRY.

Allan McLean	1-2	5/12/1899	19/11/1900
William Shiels	3	,,	,,
W. H. Irvine	4	,,	,,
J. M. Davies, M.L.C. ...	5	,,	,,
A. R. Outtrim	11-18-22	,,	,,
George Graham	15-17	,,	,,
J. H. McColl	6	,,	,,
D. Melville, M.L.C. ...	19-20	,,	,,
J. W. McCay	14-24	,,	29/12/1899
succeeded by			
C. C. Salmon	14-24	29/12/1899	19/11/1900
W. A. Watt	10	5/12/1899	,,
Theodore Fink	30	,,	21/12/1899
C. C. Salmon	30	,,	29/12/1899
J. Balfour, M.L.C. ...	30	,,	19/11/1900

XXIX.—TURNER MINISTRY.

Sir George Turner ...	1-3-24	19/11/1900	12/2/1901
I. A. Isaacs	4	,,	,,
A. J. Peacock	2-27	,,	,,
A. Wynne, M.L.C. ...	5	,,	,,
W. McCulloch, M.L.C. ..	19-20-26	,,	,,
W. A. Trenwith	15-22	,,	,,
John Morrissey	17	,,	,,
D. J. Duggan	6	,,	,,
J. B. Burton	11-18	,,	,,
William Gurr	10-14	,,	,,
E. J. Crooke, M.L.C. ...	30	,,	,,
P. Phillips, M.L.C. ...	30	,,	,,
Samuel Gillott	30	,,	,,
Robert McGregor ...	30	,,	,,

XXX.—PEACOCK MINISTRY.

A. J. Peacock	1-3-27	12/2/1901	10/6/1902
I. A. Isaacs	4	,,	4/6/1901
succeeded by			
Samuel Gillott	4	4/6/1901	10/6/1902
W. A. Trenwith	2-22-26	12/2/1901	,,
A. Wynne, M.L.C. ...	5	,,	,,
W. McCulloch, M.L.C. ...	15-20	,,	,,
John Morrissey	17	,,	,,
D. J. Duggan	6	,,	,,
J. B. Burton	11-18	,,	,,
William Gurr	14	,,	,,
Robert McGregor ...	26	,,	,,
P. Phillips, M.L.C ...	30	,,	23/5/1901
Samuel Gillott	30	,,	4/6/1901
E. J. Crooke, M.L.C. ...	30	,,	10/6/1902

XXXI.—IRVINE MINISTRY.

W. H. Irvine	1	10/6/1902	16/2/1904
John Murray	2-27	,,	,,
William Shiels	3	,,	21/7/1903
succeeded by			
W. H. Irvine	3	21/7/1903	16/2/1904
W. H. Irvine	4	10/6/1902	—/7/1903
J. M. Davies, M.L.C. ...	4	7/9/1903	16/2/1904
J. M. Davies, M.L.C. ...	5	,,	6/2/1903
succeeded by			
W. H. Irvine	5	6/2/1903	18/8/1903
succeeded by			
J. M. Davies, M.L.C. ...	5	7/9/1903	16/2/1904
Thomas Bent	9	6/2/1903	,,
Thomas Bent	22	,,	21/7/1903
succeeded by			
William Shiels	22	21/7/1903	16/2/1904
R. Reid, M.L.C.	14	10/6/1903	3/2/1903
succeeded by			
J. M. Davies, M.L.C. ...	14	6/2/1903	21/7/1903
succeeded by			
A. O. Sachse, M.L.C. ...	14	7/9/1903	16/2/1904
R. Reid, M.L.C.	20	10/6/1902	3/2/1903
succeeded by			
Thomas Bent	20	6/2/1903	16/2/1904
J. W. Taverner	15	10/6/1902	6/2/1903
J. W. Taverner	17	,,	16/2/1904
M. K. McKenzie	6	,,	28/1/1903
succeeded by			
J. W. Taverner	6	6/2/1903	16/2/1904
E. H. Cameron	11-18	10/6/1902	,,
Thomas Bent	26	,,	,,
A. O. Sachse, M.L.C. ...	26	,,	,,
W. Pitt, M.L.C.	30	,,	,,
onald McLeod	30	,,	,,
J. W. Kirton	30	,,	,,

XXXII.—BENT MINISTRY.

Name.	Office.	From—	To—
Thomas Bent	1-3-22-26	16/2/1904	8/1/1909
J. M. Davies, M.L.C. ...	4-5	,,	,,
John Murray	2-27	,,	19/2/1904
succeeded by			
Sir Samuel Gillott ...	2-27	19/2/1904	4/12/1906
succeeded by			
John E. Mackey	2-27	11/12/1906	4/1/1907
succeeded by			
Thomas Langdon ...	2-27	4/1/1907	22/2/1907
succeeded by			
Sir A. J. Peacock ...	2-27	22/2/1907	31/10/1908
succeeded by			
John E. Mackey	2-27	31/10/1908	8/1/1909
J. W. Taverner	6	16/2/1904	19/2/1904
succeeded by			
John Murray	6	19/2/1904	15/8/1906
succeeded by			
John E. Mackey	6	17/8/1906	31/10/1908
succeeded by			
Thomas Hunt	6	31/10/1908	8/1/1909
J. W. Taverner	17	16/2/1904	19/2/1904
succeeded by			
John Murray	17	19/2/1904	8/11/1904
succeeded by			
George Swinburne ...	17	8/11/1904	31/10/1908
succeeded by			
Alfred Downward ...	17	31/10/1908	8/1/1909
E. H. Cameron	15-20	16/2/1904	31/10/1908
succeeded by			
D. E. McBryde, M.L.C. ...	15-20	31/10/1908	8/1/1909
A. O. Sachse, M.L.C. ...	14	16/2/1904	31/10/1908
succeeded by			
John Bowser	14	31/10/1908	8/1/1909
Donald McLeod	11	16/2/1904	,,
Donald McLeod	18	10/3/1904	26/4/1904
succeeded by			
George Swinburne ...	18	26/4/1904	31/10/1908
succeeded by			
Alfred Downward ...	18	31/10/1908	8/1/1909
Donald McLeod	21	8/11/1904	,,
A. O. Sachse, M.L.C. ...	26	16/2/1904	31/10/1908
Thomas Langdon ...	30	,,	4/1/1907
W. Pitt, M.L.C.	30	,,	9/9/1908
John E. Mackey	30	18/2/1904	17/8/1906
John A. Boyd	30	21/2/1907	31/10/1908
Donald Mackinnon ...	30	,,	8/1/1909
A. B. Robertson	30	31/10/1908	,,
T. H. Payne, M.L.C. ...	30	,,	,,
J. Y. McDonald, M.L.C.	30	16/11/1908	,,

XXXIII.—MURRAY MINISTRY.

John Murray	1-2	8/1/1909	18/5/1912
W. A. Watt	3	,,	,,
J. D. Brown, M.L.C. ...	4-5	,,	,,
John Murray	27	,,	19/4/1911
succeeded by			
W. A. Watt	27	19/4/1911	13/10/1911
George Graham	17-18	8/1/1909	18/5/1912
W. L. Baillieu, M.L.C. ...	15-20	,,	27/2/1912
succeeded by			
W. H. Edgar, M.L.C. ...	15-20	27/2/1912	18/5/1912
Hugh McKenzie	7-8	8/1/1909	,,
A. A. Billson	14-22-26	,,	,,
Peter McBride	11-21-26	,,	
John Thomson	30	,,	..
James Cameron	30	,,	..
F. W. Hagelthorn, M.L.C.	30	,,	,,
W. H. Edgar, M.L.C. ...	30	1/6/1909	27/2/1912
W. L. Baillieu, M.L.C. ...	30	27/2/1912	18/5/1912

XXXIV.—WATT MINISTRY.

W. A. Watt	1-3	18/5/1912	9/12/1913
John Murray	2	,,	,,
J. D. Brown, M.L.C. ...	4-5	,,	,,
John Murray	27	,,	19/2/1913
succeeded by			
Sir A. J. Peacock ...	27	19/2/1913	9/12/1913
George Graham	17-18	18/5/1912	,,
A. A. Billson	26	,,	,,
Peter McBride	26	,,	19/2/1913
Peter McBride ...	11-21-22	,,	,,
succeeded by			
A. A. Billson	11-21-22	19/2/1913	9/12/1913
A. A. Billson	14	18/5/1912	19/2/1913
succeeded by			
Sir A. J. Peacock ...	14	19/2/1913	9/12/1913
Sir A. J. Peacock ...	26-27	,,	,,
Hugh McKenzie	6	18/5/1912	,,
W. H. Edgar, M.L.C. ...	15-20	,,	21/6/1913
succeeded by			
F. W. Hagelthorn, M.L.C.	15-20	21/6/1913	9/12/1913
F. W. Hagelthorn, M.L.C.	30	18/5/1912	21/6/1913
W. L. Baillieu, M.L.C. ...	30	,,	9/12/1913
John Thomson	30	,,	,,
James Cameron	30	,,	,,
W. A. Adamson, M.L.C.	30	30/6/1913	,,

XXXV.—ELMSLIE MINISTRY.

Name.	Office.	From—	To—
G. A. Elmslie	1-3	9/12/1913	22/12/1913
G. M. Prendergast ...	2	,,	,,
W. J. Evans, M.L.C. ...	4-5-20	,,	,,
John Lemmon	14-27	,,	,,
William Plain	6-17-18	,,	,,
A. R. Outtrim	11-21-26	,,	,,
J. W. Billson	22-26	,,	,,
A. McLellan, M.L.C. ..	15	,,	,,
J. P. Jones, M.L.C. ...	30	,,	,,
W. H. Fielding, M.L.C. ...	30	,,	,,
David Smith	30	,,	,,
Martin Hannah	30	,,	,,

XXXVI.—WATT MINISTRY.

W. A. Watt	1-3	22/12/1913	18/6/1914
John Murray	2	,,	,,
Sir A. J. Peacock ...	14-27	,,	,,
Donald Mackinnon ...	4-5-22-26	,,	,,
J. D. Brown, M.L.C. ...	11-20-21-26	,,	,,
F. W. Hagelthorn, M.L.C.	15	,,	,,
H. S. W. Lawson ...	6	,,	,,
W. Hutchinson	17-18	,,	,,
W. L. Baillieu, M.L.C. ...	30	,,	,,
W. A. Adamson, M.L.C.	30	,,	,,
Thomas Livingston ...	30	,,	,,
John Gray...	30	,,	,,

XXXVII.—PEACOCK MINISTRY.

Sir A. J. Peacock ...	1-3	18/6/1914	29/11/1917
John Murray	2	,,	9/11/1915
succeeded by			
Donald McLeod	2	9/11/1915	29/11/1917
Donald Mackinnon ...	4-5	18/6/1914	9/11/1915
succeeded by			
H. S. W. Lawson ...	4-5	9/11/1915	29/11/1917
Sir A. J. Peacock ...	27	18/6/1914	10/8/1915
succeeded by			
John Murray	27	10/8/1915	9/11/1915
succeeded by			
Sir A. J. Peacock ...	27	9/11/1915	29/11/1917
Donald Mackinnon ...	22-26	18/6/1914	9/11/1915
succeeded by			
Hugh McKenzie	22-26	9/11/1915	29/11/1917
J. D. Brown, M.L.C. ...	11-21-26	18/6/1914	9/11/1915
succeeded by			
Thomas Livingston ...	11-21-26	9/11/1915	29/11/1917
J. D. Brown, M.L.C. ...	20	18/6/1914	9/11/1915
succeeded by			
Donald McLeod	20	9/11/1915	29/11/1917
F. W. Hagelthorn, M.L.C.	15	18/6/1914	9/11/1915
succeeded by			
W. A. Adamson, M.L.C.	15	9/11/1915	29/11/1917
William Hutchinson ...	17	18/6/1914	9/11/1915
succeeded by			
F. W. Hagelthorn, M.L.C.	17	9/11/1915	29/11/1917
H. S. W. Lawson ...	6	18/6/ 1914	9/11/1915
succeeded by			
William Hutchinson ...	6	9/11/1915	29/11/1917
Thomas Livingston ...	14	18/6/1914	9/11/1915
succeeded by			
H. S. W. Lawson ...	14	9/11/1915	29/11/1917
William Hutchinson ...	14	18/6/1914	9/11/1915
succeeded by			
Hugh McKenzie	18	9/11/1915	29/11/1917
W. A. Adamson, M.L.C.	30	18/6/1914	9/11/1915
W. L. Baillieu, M.L.C. ...	30	,,	29/11/1917
John Gray...	30	,,	,,
J. G. Membrey	30	20/7/1914	,,
R. G. McCutcheon ...	30	9/11/1915	10/11/1916
Arthur Robinson, M.L.C.	30	,,	29/11/1917
Samuel Barnes	30	18/9/1917	,,

XXXVIII.—BOWSER MINISTRY.

John Bowser	2-27	29/11/1917	21/3/1918
Agar Wynne	4-5-22-26	,,	,,
W. M. McPherson ...	3	,,	,,
Alfred Downward ...	11-20-21-26	,,	,,
F. G. Clarke, M.L.C. ...	6-18	,,	,,
Matthew Baird	14	,,	,,
J. McWhae, M.L.C. ...	15	,,	,,
David Swan Oman ...	17	,,	,,
W. Kendell, M.L.C. ...	30	,,	,,
H. F. Richardson, M.L.C.	30	,,	,,
Henry Angus	30	,,	,,
J. J. Carlisle	30	,,	,,

XXXIX.—LAWSON MINISTRY.

H. S. W. Lawson ...	1	21/3/1918	7/9/1923
John Bowser	2-20	,,	30/6/1919
succeeded by			
Matthew Baird	2-20	7/7/1919	7/9/1923
W. M. McPherson ...	3	21/3/1918	,,

XXXIX.—LAWSON MINISTRY (*continued*).

Name.	Office.	From—	To—
H. S W. Lawson ...	4	,,	21/10/1919
succeeded by			
A. Robinson, M.L.C. ...	4	21/10/1919	7/9/1923
H. S. W. Lawson ...	27	21/3/1918	7/7/1919
succeeded by			
Matthew Baird	27	7/7/1919	4/11/1920
succeeded by			
Sir A. J. Peacock ...	27	4/11/1920	7/9/1923
F. G. Clarke, M.L.C. ...	6	21/3/1918	21/10/1919
succeeded by			
H. S. W. Lawson ...	6	21/10/1919	4/11/1920
succeeded by			
David Swan Oman ...	6	4/11/1920	7/9/1923
A. Robinson, M.L.C. ...	5	21/3/1918	20/1/1920
succeeded by			
H. S. W. Lawson ...	5	20/1/1920	20/9/1920
succeeded by			
A. Robinson, M.L.C. ...	5	20/9/1920	7/9/1923
David Swan Oman ...	17	21/3/1918	4/11/1920
succeeded by			
H. S. W. Lawson ...	17	4/11/1920	7/9/1923
F. G. Clarke, M.L.C. ...	18	21/3/1918	22/2/1921
succeeded by			
H. S. W. Lawson ...	18	22/2/1921	7/9/1923
A. Robinson, M.L.C. ...	15	21/3/1918	21/10/1919
succeeded by			
F. G. Clarke, M.L.C. ...	15	21/10/1919	29/8/1923
William Hutchinson ...	14-21-26	21/3/1918	4/11/1920
succeeded by			
Sir A. J. Peacock ...	14-21-26	4/11/1920	7/9/1923
Samuel Barnes	11-22-26	21/3/1918	,,
David Swan Oman ...	28	8/5/1923	,,
A. R. Robertson	30	21/3/1918	15/4/1919
W. Kendell, M.L.C. ...	30	,,	9/7/1919
H. J. M. Campbell ...	30	,,	1/11/1920
J. McWhae, M.L.C. ...	30	,,	22/11/1921
Donald Mackinnon ...	30	5/6/1919	1/11/1920
A. Hicks, M.L.C.	30	18/5/1920	6/9/1921
Henry Angus	30	4/11/1920	7/9/1923
J. W. Pennington ...	30	,,	22/2/1921
J. W. Pennington ...	30	1/7/1921	7/9/1923
Norman Livingston ...	30	22/2/1921	30/6/1921
J. K. Merritt, M.L.C. ...	30	17/1/1922	7/9/1923
G. M. Davis, M.L.C. ...	30	,,	,,

XL.—LAWSON MINISTRY.

H. S. W. Lawson ...	1	7/9/1923	19/3/1924
S. S. Argyle	2-20	,,	,,
Sir W. M. McPherson ...	3	,,	20/11/1924
H. S. W. Lawson ...	3	28/2/1924	19/3/1924
Sir A. Robinson, M.L.C.	4-5	7/9/1923	,,
H. S. W. Lawson ...	18	,,	28/2/1924
succeeded by			
F. W. Eggleston	18	28/2/1924	19/3/1924
John Allan	6-28	7/9/1923	,,
Sir A. J. Peacock ...	14-21,26,27	,,	,,
Francis E. Old	17-22-26	,,	,,
G. L. Goudie, M.L.C. ...	11-15	,,	,,
H. I. Cohen, M.L.C. ...	30	,,	,,
John Gordon	30	,,	,,
M. E. Wettenhall ...	30	,,	,,
W. P. Crockett, M.L.C. ...	30	12/9/1923	,,

XLI.—LAWSON MINISTRY.

H. S. W. Lawson ...	1-3	19/3/1924	28/4/1924
Sir A. Robinson, M.L.C.	4-5	,,	,,
S. S. Argyle	2-20	,,	,,
Sir A. J. Peacock ...	14-21-26-27	,,	,,
David Swan Oman ...	6-28	,,	,,
F. W. Eggleston	22-26	,,	,,
H. I. Cohen, M.L.C. ...	11-15	,,	,,
John Gordon	17-18-26	,,	,,
F. W. Brawn, M.L.C. ...	30	,,	,,
Martin McGregor, M.L.C.	30	,,	,,
Frank Groves	30	,,	,,
Henry Beardmore ...	30	,,	,,

XLII.—PEACOCK MINISTRY.

Sir A. J. Peacock ...	1-3-27	28/4/1924	18/7/1924
Sir A. Robinson, M.L.C.	4-5	,,	11/7/1924
succeeded by			
H. I. Cohen, M.L.C. ...	4-5	11/7/1924	18/7/1924
S. S. Argyle	2-20	28/4/1924	,,
David Swan Oman ...	6-28	,,	,,
F. W. Eggleston	22-26	,,	,,
H. I. Cohen, M.L.C. ...	11-15	,,	,,
John Gordon	17-18-26	,,	,,
R. F. Toutcher	14-21-26	,,	,,
F. W. Brawn, M.L.C. ...	30	,,	,,
M. McGregor, M.L.C. ...	30	,,	,,
Frank Groves	30	,,	,,
Henry Beardmore ..	30	,,	,,

XLIII.—PRENDERGAST MINISTRY.

Name.	Office.	From—	To—
G. M. Prendergast ...	1-3	18/7/1924	18/11/1924
T. Tunnecliffe	2	,,	,,
John Lemmon	14-27	,,	,,
E. J. Hogan	17-22-26	,,	,,
William Slater	4-5	,,	,,
J. P. Jones, M.L.C. ...	15-20-28	,,	,,
D. L. McNamara, M.L.C.	11-21-26	,,	,,
E. J. Hogan	29	24/7/1924	,,
W. J. Beckett, M.L.C. ...	30	18/7/1924	,,
J. H. Disney, M.L.C. ...	30	,,	,,
John Cain	30	,,	,,
G. C. Webber	30	,,	,,

XLIV.—ALLAN MINISTRY.

John Allan	1-18	18/11/1924	
Sir A. J. Peacock ...	3-14-27	,,	
S. S. Argyle	2-20	,,	
F. W. Eggleston ...	4-5-26	,,	
F. W. Eggleston ...	22	,,	24/8/1926
succeeded by			
John Allan	22	24/8/1926	
Alfred Downward ...	6-28	18/11/1924	
H. F. Richardson, M.L.C.	21-26	,,	
G. L. Goudie, M.L.C. ...	9-11-26	,,	
M. W. J. Bourchier ...	17-29	,,	
W. P. Crockett, M.L.C. ...	30	,,	29/6/1925
M. McGregor, M.L.C. ...	30	,,	
James McDonald ...	30	,,	
E. J. Mackrell	30	,,	
J. R. Harris, M.L.C. ...	30	2/7/1925	

SOUTH AUSTRALIA.

KEY TO OFFICE.

1. Premier.
2. Chief Secretary; and Minister of Health (since 1898).
3. Treasurer.
4. Attorney-general.
5. Solicitor-general.
6. Commissioner of Crown Lands.
7. Minister of Immigration.
8. Commissioner of Crown Lands and Immigration.
9. Commissioner of Public Works.
10. Minister of Industry.
11. Minister of Mines.
12. Minister of Education and of the Northern Territory.
13. Minister of Justice and Education.
14. Minister of Education.
15. Minister of Agriculture.
16. Minister Controlling the Northern Territory.
17. Minister of Agriculture.
18. Minister for Water-supply.
19. Minister of Repatriation.
20. Minister of Housing.
21. Minister of Railways.
22. Minister of Irrigation.
23. Minister of Local Government.
24. Minister of Town-planning.
25. Minister of Marine.
26. Minister without Portfolio (sometimes called Assistant Minister).

I.—FINNISS MINISTRY.

Name.	Office.	From—	To—
Boyle T. Finniss	1-2	24/10/1856	21/8/1857
R. D. Hanson	4	,,	,,
R. R. Torrens	3	,,	,,
Charles Bonney	8	,,	,,
A. H. Freeling	9	,,	20/3/1857
succeeded by			
Samuel Davenport ...	9	20/3/1857	21/8/1857

II.—BAKER MINISTRY.

John Baker	1-2	21/8/1857	1/9/1857
Edward C. Gwynne ...	4	,,	,,
John Hart	3	,,	,,
William Milne	8	,,	,,
Arthur Blyth	9	,,	,,
John T. Bagot	5	,,	,,

III.—TORRENS MINISTRY.

Name.	Office.	From—	To—
R. R. Torrens	1-2	1/9/1857	30/9/1857
R. B. Andrews	4	,,	,,
John B. Hughes	3	,,	,,
Marshall MacDermott ...	8	,,	,,
Samuel Davenport ...	9	,,	,,

IV.—HANSON MINISTRY.

R. D. Hanson	1-4	30/9/1857	9/5/1860
William Younghusband ...	2	,,	,,
John Hart	3	,,	12/6/1858
succeeded by			
B. T. Finniss	3	12/6/1858	9/5/1860
F. S. Dutton	8	30/9/1857	2/6/1859
succeeded by			
John B. Neales	8	2/6/1859	5/7/1859
succeeded by			
William Milne	8	5/7/1859	9/5/1860
Thomas Reynolds ...	9	30/9/1857	12/6/1858
succeeded by			
Arthur Blyth	9	12/6/1858	9/5/1860

V.—REYNOLDS MINISTRY.

Thomas Reynolds ...	1-3	9/5/1860	20/5/1861
G. M. Waterhouse ...	2	,,	4/2/1861
succeeded by			
John Morphett	2	4/2/1861	20/5/1861
H. B. T. Strangways ...	4	9/5/1860	,,
John T. Bagot	8	,,	,,
Alexander Hay	9	,,	,,

VI.—REYNOLDS MINISTRY.

Thomas Reynolds ...	1-3	20/5/1861	8/10/1861
John Morphett	2	,,	,,
R. I. Stow	4	,,	,,
H. B. T. Strangways ...	8	,,	,,
Alexander Hay	9	,,	,,

VII.—WATERHOUSE MINISTRY.

G. M. Waterhouse ...	1-2	8/10/1861	17/10/1861
Henry Gawler	4	,,	,,
Arthur Blyth	3	,,	,,
M. Moorhouse	8	,,	,,
Philip Santo	9	,,	,,

VIII.—WATERHOUSE MINISTRY.

G. M. Waterhouse ...	1-2	17/10/1861	4/7/1863
R. I. Stow	4	,,	,,
Thomas Reynolds ...	3	,,	19/2/1862
succeeded by			
Arthur Blyth	3	19/2/1862	4/7/1863
H. B. T. Strangways ...	8	17/10/1861	,,
John Lindsay	9	,,	19/2/1862
succeeded by			
William Milne	9	19/2/1862	4/7/1863

IX.—DUTTON MINISTRY.

F. S. Dutton	1-8	4/7/1863	15/7/1863
John Hart	2	,,	,,
R. B. Andrews	4	,,	,,
Lavington Glyde	8	,,	,,
William Townsend ...	9	,,	,,
Henry Ayers	26	,,	,,

X.—AYERS MINISTRY.

Henry Ayers	1-2	15/7/1863	22/7/1864
R. B. Andrews	4	,,	,,
John Hart	3	,,	,,
Lavington Glyde	8	,,	,,
Philip Santo	9	,,	,,

XI.—AYERS MINISTRY.

Henry Ayers	1-2	22/7/1864	4/8/1864
R. I. Stow	4	,,	,,
John Hart	3	,,	,,
William Milne	8	,,	,,
Philip Santo	9	,,	,,

XII.—BLYTH MINISTRY.

Arthur Blyth	1-8	4/8/1864	22/3/1865
Henry Ayers	2	,,	,,
R. I. Stow	4	,,	,,
John Hart	3	,,	,,
William Milne	9	,,	,,

XIII.—DUTTON MINISTRY.

F. S. Dutton	1-9	22/3/1865	20/9/1865
Henry Ayers	2	,,	,,
R. B. Andrews	4	,,	,,
Thomas Reynolds ...	3	,,	,,
H. B. T. Strangways ...	8	,,	,,

XIV.—AYERS MINISTRY.

Name.	Office.	From—	To—
Henry Ayers	1-2	20/9/1865	23/10/1865
R. B. Andrews	4	,,	,,
Arthur Blyth	3	,,	,,
H. B. T. Strangways ...	8	,,	,,
Philip Santo	9	,,	,,

XV.—HART MINISTRY.

John Hart	1-2	23/10/1865	28/3/1866
J. P. Boucaut	4	,,	,,
Walter Duffield	3	,,	,,
Lavington Glyde	8	,,	1/11/1865
succeeded by			
John B. Neales	8	1/11/1865	28/3/1866
Thomas English	9	23/10/1865	,,

XVI.—BOUCAUT MINISTRY.

James P. Boucaut ...	1-4	28/3/1866	3/5/1867
Arthur Blyth	2	,,	,,
Walter Duffield	3	,,	,,
William Milne	8	,,	,,
Thomas English	9	,,	,,

XVII.—AYERS MINISTRY.

Henry Ayers	1-2	3/5/1867	24/9/1868
R. B. Andrews	4	,,	,,
Thomas Reynolds ...	3	,,	,,
Lavington Glyde	8	,,	,,
Philip Santo	9	,,	,,

XVIII.—HART MINISTRY.

John Hart	1-2	24/9/1868	13/10/1868
J. T. Bagot	4	,,	,,
Neville Blyth	3	,,	,,
William Townsend ...	8	,,	,,
William Everard	9	,,	,,

XIX.—AYERS MINISTRY.

Henry Ayers	1-2	13/10/1868	3/11/1868
R. B. Andrews	4	,,	,,
Thomas Reynolds ...	3	,,	,,
Lavington Glyde	8	,,	,,
Philip Santo	9	,,	,,

XX.—STRANGWAYS MINISTRY.

H. B. T. Strangways ...	1-4	3/11/1868	12/5/1870
J. T. Bagot	2	,,	,,
H. K. Hughes	3	,,	,,
W. Cavenagh	8	,,	,,
John Colton	9	,,	,,

XXI.—STRANGWAYS MINISTRY.

H. B. T. Strangways ...	1-4	12/5/1870	30/5/1870
Augustine Stow	2	,,	,,
E. A. Hamilton	3	,,	,,
W. Cavenagh	8	,,	,,
F. E. H. W. Krichauff ...	9	,,	,,

XXII.—HART MINISTRY.

John Hart	1-3	30/5/1870	10/11/1871
William Milne	2	,,	,,
R. C. Baker	4	,,	21/7/1871
succeeded by			
Charles Mann	4	21/7/1871	10/11/1871
Arthur Blyth	8	30/5/1870	,,
John Carr	9	,,	,,

XXIII.—BLYTH MINISTRY.

Arthur Blyth	1-3	10/11/1871	22/1/1872
William Milne	2	,,	,,
Charles Mann	4	,,	,,
W. Townsend	8	,,	,,
John Carr	9	,,	,,

XXIV.—AYERS MINISTRY.

Henry Ayers	1-2	22/1/1872	4/3/1872
J. P. Boucaut	4	,,	,,
H. K. Hughes	3	,,	,,
E. H. Derrington ...	8	,,	,,
James G. Ramsay ...	9	,,	,,

XXV.—AYERS MINISTRY.

Sir H. Ayers	1-2	4/3/1872	22/7/1873
G. J. W. Stevenson ...	4	,,	,,
J. H. Barrow	3	,,	,,
Thomas Reynolds ...	8	,,	,,
W. Cavenagh	9	,,	,,

XXVI.—BLYTH MINISTRY.

Name.	Office.	From—	To—
Arthur Blyth	1-2	22/7/1873	3/6/1875
Charles Mann	4	,,	,,
Lavington Glyde	3	,,	25/5/1875
succeeded by			
G. C. Hawker	3	25/5/1875	3/6/1875
William Everard	8	22/7/1873	,,
H. E. Bright	9	,,	,,
W. H. Bundey	18	2/7/1874	15/3/1875
succeeded by			
John Cox Bray	18	15/3/1875	3/6/1875

XXVII.—BOUCAUT MINISTRY.

J. P. Boucaut	1	3/6/1875	25/3/1876
William Morgan	2	,,	,,
S. J. Way	4	,,	18/3/1876
succeeded by			
Henry Gawler	4	21/3/1876	25/3/1876
John Colton	3	3/6/1875	,,
J. P. Boucaut	8	,,	2/2/1876
succeeded by			
Thomas Playford ...	8	2/2/1876	25/3/1876
W. A. E. West-Erskine ...	9	3/6/1875	2/2/1876
succeeded by			
J. P. Boucaut	9	2/2/1876	25/3/1876
Ebenezer Ward	15	3/6/1875	,,

XXVIII.—BOUCAUT MINISTRY.

J. P. Boucaut	1-9	25/3/1876	6/6/1876
G. C. Hawker	2	,,	,,
Charles Mann	4	,,	,,
Arthur Blyth	3	,,	,,
Thomas Playford ...	8	,,	,,
William Everard	14	,,	,,

XXIX.—COLTON MINISTRY.

John Colton	1-9	6/6/1876	26/10/1877
Sir H. Ayers	2	,,	,,
John Cox Bray	4	,,	,,
R. D. Ross	3	,,	,,
John Carr	8	,,	,,
Ebenezer Ward	15	,,	,,

XXX.—BOUCAUT MINISTRY.

J. P. Boucaut	1-3	26/10/1877	27/9/1878
William Morgan	2	,,	,,
Charles Mann	4	,,	,,
Thomas Playford ...	8	,,	,,
G. C. Hawker	9	,,	,,
Neville Blyth	14	,,	,,

XXXI.—MORGAN MINISTRY.

William Morgan	1-2	27/9/1878	24/6/1881
W. H. Bundey	4	,,	10/3/1881
succeeded by			
J. H. Symon	4	10/3/1881	24/6/1881
Charles Mann	2	27/9/1878	10/3/1881
succeeded by			
G. S. Fowler	3	10/3/1881	10/5/1881
succeeded by			
W. B. Rounsevell ...	3	10/5/1881	24/6/1881
Thomas Playford ...	8	27/9/1878	,,
G. C. Hawker	9	,,	,,
Rowland Rees	14	,,	7/10/1878
succeeded by			
Thomas King	14	7/10/1878	10/3/1881
succeeded by			
M. P. F. Basedow ...	14	10/3/1881	24/6/1881

XXXII.—BRAY MINISTRY.

John Cox Bray	1	24/6/1881	16/6/1884
John Cox Bray	2	,,	23/4/1884
succeeded by			
J. G. Ramsay	2	23/4/1884	16/6/1884
Lavington Glyde	3	24/6/1881	23/4/1884
succeeded by			
John Cox Bray	3	23/4/1884	16/6/1884
J. G. Ramsay	9	24/6/1881	23/4/1884
succeeded by			
David Bower	9	23/4/1884	16/6/1884
J. W. Downer	4	24/6/1881	,,
Alfred Catt	8	,,	,,
John L. Parsons	14	,,	12/3/1884
succeeded by			
E. T. Smith	14	12/3/1884	16/6/1884

XXXIII.—COLTON MINISTRY.

Name.	Office.	From—	To—
John Colton	1-2	16/6/1884	16/6/1885
C. C. Kingston	4	,,	,,
W. B. Rounsevell ...	3	,,	,,
Jenkin Coles	8	,,	4/2/1885
succeeded by			
Thomas Playford ...	8	4/2/1885	16/6/1885
Thomas Playford ...	9	16/6/1884	4/2/1885
succeeded by			
Jenkin Coles	9	4/2/1885	16/6/1885
R. C. Baker	13	16/6/1884	,,

XXXIV.—DOWNER MINISTRY.

John W. Downer ...	1-4	16/6/1885	11/6/1887
J. B. Spence, M.L.C. ...	2	,,	14/10/1885
succeeded by			
John Cox Bray	2	14/10/1885	8/6/1886
succeeded by			
J. B. Spence, M.L.C. ...	2	8/6/1886	9/7/1886
succeeded by			
David Murray	2	9/7/1886	11/6/1887
Simpson Newland ...	3	16/6/1885	8/6/1886
succeeded by			
John Cox Bray	3	8/6/1886	11/6/1887
J. H. Howe	8	16/6/1885	,,
John Darling	9	,,	14/10/1885
succeeded by			
John B. Spence	9	14/10/1885	8/6/1886
succeeded by			
Luke L. Furner	9	8/6/1886	11/6/1887
J. A. Cockburn	14	16/6/1885	,,

XXXV.—PLAYFORD MINISTRY.

Thomas Playford ...	1-3	11/6/1887	27/6/1889
J. G. Ramsay	2	,,	,,
C. C. Kingston	4	,,	,,
Jenkin Coles	8	,,	,,
Alfred Catt	9	,,	,,
J. C. F. Johnson	14	,,	,,

XXXVI.—COCKBURN MINISTRY.

J. A. Cockburn	1-2	27/6/1889	19/8/1890
B. A. Moulden	4	,,	19/3/1890
succeeded by			
F. F. Turner	4	31/3/1890	2/5/1890
succeeded by			
H. E. Downer	4	2/5/1890	19/8/1890
F. W. Holder	3	27/6/1889	,,
Thomas Burgoyne ...	8	,,	2/5/1890
succeeded by			
J. H. Howe	8	2/5/1890	8/7/1890
succeeded by			
J. J. Osman	8	8/7/1890	19/8/1890
J. H. Howe	9	27/6/1889	2/5/1890
succeeded by			
Thomas Burgoyne ...	9	2/5/1890	19/8/1890
John H. Gordon	12	27/6/1889	,,

XXXVII.—PLAYFORD MINISTRY.

Thomas Playford ...	1	19/8/1890	21/6/1892
Thomas Playford ...	3	,,	6/1/1892
succeeded by			
W. B. Rounsevell ...	3	6/1/1892	21/6/1892
Sir John C. Bray ...	2	19/8/1890	6/1/1892
succeeded by			
C. C. Kingston	2	6/1/1892	21/6/1892
Robert Homburg ...	4	19/8/1890	,,
W. B. Rounsevell ...	9	,,	6/1/1892
succeeded by			
John G. Jenkins	9	6/1/1892	21/6/1892
W. Copley, M.L.C. ...	8	19/8/1890	6/1/1892
succeeded by			
Thomas Playford ...	8	6/1/1892	21/6/1892
David Bews	12	19/8/1890	24/2/1891
succeeded by			
John G. Jenkins	12	2/3/1891	6/1/1892
W. Copley, M.L.C. ...	15	6/1/1892	21/6/1892

XXXVIII.—HOLDER MINISTRY.

F. W. Holder	1-3	21/6/1892	15/10/1892
J. A. Cockburn	2	,,	,,
W. F. Stock	4	,,	,,
P. P. Gillen	8	,,	,,
A. D. Handyside	9	,,	,,
J. H. Gordon, M.L.C. ...	14	,,	,,

XXXIX.—DOWNER MINISTRY.

Sir J. W. Downer ...	1	15/10/1892	16/6/1893
Sir J. W. Downer ...	2	,,	12/5/1893
succeeded by			
W. Copley, M.L.C. ...	2	12/5/1893	16/6/1893
W. B. Rounsevell ...	3	15/10/1892	12/5/1893
succeeded by			
Sir J. W. Downer ...	3	12/5/1893	16/6/1893

XXXIX.—DOWNER MINISTRY (*continued*).

Name.	Office.	From—	To—
Robert Homburg ...	4	15/10/1892	16/6/1893
J. H. Howe	6	,,	,,
Lawrence Grayson ...	9	,,	12/5/1893
succeeded by			
John Moule	9	12/5/1893	16/6 1893
W. Copley, M.L.C. ...	15	15/10/1892	12/5/1893
succeeded by			
John W. Castine	15	12/5/1893	16/6/1893

XL.—KINGSTON MINISTRY.

C. C. Kingston	1-1	16/6/1893	1/12/1899
C. C. Kingston	10	10/1/1895	,,
J. H. Gordon, M.L.C. ...	2	16/6/1893	15/2/1896
succeeded by			
J. V. O'Loghlin, M.L.C. ...	2	18/3/1896	1/12/1899
Thomas Playford ...	3-16	16/6/1893	17/4/1894
succeeded by			
F. W. Holder	3-16	17/4/1894	1/12/1899
Peter P. Gillen	6	16/6/1893	22/9/1896
succeeded by			
Laurence O'Loughlin ...	6	28/9/1896	1/12/1899
F. W. Holder	9	16/6/1893	17/4/1894
succeeded by			
John G. Jenkins	9	20/4/1894	1/12/1899
J. A. Cockburn	15	16/6/1893	13/4/1898
succeeded by			
Richard Butler	15	13/4/1898	1/12/1899

XLI.—SOLOMON MINISTRY.

V. L. Solomon	1-3	1/12/1899	8/12/1899
J. L. Stirling, M.L.C. ...	2	,,	,,
P. McMahon Glynn ...	4	,,	,,
Alexander Poynton ...	6	,,	,,
W. B. Rounsevell ...	9	,,	,,
Thomas Burgoyne ...	15	,,	,,

XLII.—HOLDER MINISTRY.

F. W. Holder	1-3-10	8/12/1899	15/5/1901
J. G. Jenkins	2	,,	,,
J. H. Gordon, M.L.C. ...	4	,,	,,
Laurence O'Loughlin ...	6	,,	,,
R. W. Foster	9	,,	,,
E. L. Batchelor	15	,,	,,

XLIII.—JENKINS MINISTRY.

John G. Jenkins	1-2-16	15/5/1901	1/3/1905
J. H. Gordon, M.L.C. ...	4	,,	2/12/1903
succeeded by			
L. Von Doussa, M.L.C. ...	4	2/12/1903	4/7/1904
succeeded by			
Robert Homburg ...	4	4/7/1904	24/2/1905
Richard Butler	3	15/5/1901	1/3/1905
R. W. Foster	9	,,	4/7/1904
succeeded by			
J. Vardon, M.L.C. ...	9	4/7/1904	1/3/1905
T. H. Brooker	14	15/5/1901	31/3/1902
succeeded by			
J. H. Gordon, M.L.C. ...	14	1/4/1902	2/12/1903
succeeded by			
L. Von Doussa, M.L.C. ...	14	2/12/1903	4/7/1904
succeeded by			
Robert Homburg ...	14	4/7/1904	24/2/1905
Laurence O'Loughlin ...	6	15/5/1901	31/3/1902
succeeded by			
Richard Butler	8	1/4/1902	1/3/1905
T. H. Brooker	10	15/5/1901	31/3/1902
succeeded by			
R. W. Foster	10	1/4/1902	4/7/1904
succeeded by			
J. Vardon, M.L.C. ...	10	4/7/1904	1/3/1905

XLIV.—BUTLER MINISTRY.

Richard Butler	1-3-8	1/3/1905	26/7/1905
J. Vardon, M.L.C. ...	2-19	,,	,,
J. R. Anderson	4	,,	,,
R. W. Foster	9-17	,,	,,

XLV.—PRICE MINISTRY.

Thomas Price	1-9	26/7/1905	31/5/1909
A. H. Peake	1	31/5/1909	5/6/1909
A. A. Kirkpatrick, M.L.C.	2-10	26/7/1905	27/3/1909
succeeded by			
F. S. Wallis, M.L.C. ...	2-10	27/3/1909	5/6/1909
A. H. Peake	3-4	26/7/1905	,,
Laurence O'Loughlin ...	8-17	,,	,,
Laurence O'Loughlin ...	16	,,	30/12/1908
succeeded by			
J. G. Bice, M.L.C. ...	16-18	30/12/1908	5/6/1909
Thomas Price	14	26/7/1905	30/12/1908
succeeded by			
F. W. Coneybeer	14	30/12/1908	5/6/1909

XLVI.—PEAKE MINISTRY.

Name.	Office.	From—	To—
A. H. Peake	1-14	5/6/1909	3/6/1910
J. G. Bice, M.L.C. ...	2-10	,,	,,
A. H. Peake ... ... succeeded by	3	,,	22/12/1909
Richard Butler	3	22/12/1909	3/6/1910
S. J. Mitchell ... ... succeeded by	4	5/6/1909	22/12/1909
Hermann Homburg ...	4	22/12/1909	3/6/1910
E. H. Coombe ... ... succeeded by	8	5/6/1909	22/12/1909
A. H. Peake	8	22/12/1909	3/6/1910
E. H. Coombe ... ... succeeded by	17	5/6/1909	22/12/1909
T. Pascoe, M.L.C. ...	17	22/12/1909	3/6/1910
Laurence O'Loughlin ... succeeded by	9	5/6/1909	,,
Laurence O'Loughlin ... succeeded by	16	,,	22/12/1909
Richard Butler	16	22/12/1909	3/6/1910
Laurence O'Loughlin ...	18	,,	,,
A. R. Addison, M.L.C. ...	26	5/6/1909	22/12/1909

XLVII.—VERRAN MINISTRY.

John Verran	1-9-11-18-16	3/6/1910	17/2/1912
F. S. Wallis, M.L.C. ...	2	,,	,,
W. J. Denny	4	,,	,,
W. J. Denny	16	,,	1/1/1911
Crawford Vaughan ...	3-8	,,	17/2/1912
F. W. Coneybeer	14	,,	,,
J. P. Wilson, M.L.C. ...	10-17	,,	,,

XLVIII.—PEAKE MINISTRY.

A. H. Peake	1-3	17/2/1912	3/4/1915
J. G. Bice, M.L.C. ...	2	,,	,,
Hermann Homburg ... succeeded by	4	,,	21/1/1915
H. A. Parsons	4	21/1/1915	3/4/1915
A. H. Peake ... ... succeeded by	14	17/2/1912	21/1/1915
H. A. Parsons	14	21/1/1915	3/4/1915
Hermann Homburg ... succeeded by	10	17/2/1912	21/1/1915
A. H. Peake	10	21/1/1915	3/4/1915
F. W. Young ... ... succeeded by	6	17/2/1912	19/11/1914
Sir Richard Butler ...	6	19/11/1914	3/4/1915
F. W. Young	7	17/2/1912	19/11/1914
Richard Butler ... ... succeeded by	9	,,	,,
George Ritchie	9-18	19/11/1914	3/4/1915
Richard Butler	11-25	17/2/1912	,,
T. Pascoe, M.L.C. ...	17-22	,,	,,

XLIX.—VAUGHAN MINISTRY.

Crawford Vaughan ...	1-3-14	3/4/1915	14/7/1917
A. W. Styles, M.L.C. ...	2	,,	,,
J. H. Vaughan, M.L.C. ...	4	,,	,,
Clarence Goode	8-17	,,	,,
Harry Jackson	9-18	,,	,,
R. P. Blundell	10-11-25	,,	,,

L.—PEAKE MINISTRY.

A. H. Peake	1	14/7/1917	6/4/1920
A. H. Peake ... ... succeeded by	2	,,	15/5/1919
J. G. Bice, M.L.C. ...	2	15/5/1919	8/4/1920
Sir Richard Butler ... succeeded by	3	14/7/1917	7/5/1919
A. H. Peake	3	15/5/1919	6/4/1920
H. N. Barwell ... ... succeeded by	4	14/7/1917	27/8/1917
A. H. Peake ... ... succeeded by	4	27/8/1917	29/4/1918
H. N. Barwell	4	29/4/1918	8/4/1920
George Ritchie ... ... succeeded by	8	14/7/1917	27/8/1917
Harry Jackson ... ... succeeded by	8	27/8/1917	29/4/1918
E. A. Anstey	8	29/4/1918	8/4/1920
Sir Richard Butler ... succeeded by	21	14/7/1917	7/5/1919
George Ritchie	21	15/5/1919	8/4/1920
J. G. Bice, M.L.C. ... succeeded by	11	14/7/1917	18/12/1918
W. H. Harvey, M.L.C. ..	11	19/12/1918	8/4/1920
J. G. Bice, M.L.C. ...	25	14/7/1917	,,
H. N. Barwell ... ... succeeded by	10	,,	27/8/1917
R. P. Blundell ... ... succeeded by	10	27/8/1917	29/4/1918
H. N. Barwell	10	29/4/1918	8/4/1920
George Ritchie .. ... succeeded by	17	14/7/1917	27/8/1917
R. P. Blundell ... succeeded by	17	27/8/1917	29/4/1918
E. A. Anstey ... ... succeeded by	17	29/4/1918	19/12/1918
Sir Richard Butler ... succeeded by	17	19/12/1918	7/5/1919
W. H. Harvey, M.L.C. ...	17	24/7/1919	8/4/1920

L.—PEAKE MINISTRY (*continued*).

Name.	Office.	From—	To—
D. J. Gordon, M.L.C. ... succeeded by	14	14/7/1917	27/8/1917
A. W. Styles, M.L.C. ... succeeded by	14	27/8/1917	7/1/1918
W. H. Harvey, M.L.C. ...	14	15/2/1918	8/4/1920
D. J. Gordon, M.L.C. ... succeeded by	19	14/7/1917	27/8/1917
R. P. Blundell ... ... succeeded by	19	27/8/1917	29/4/1918
E. A. Anstey	19	29/4/1918	8/4/1920
J. G. Bice, M.L.C. ...	22	19/12/1918	,,
J. G. Bice, M.L.C. ... succeeded by	9	14/7/1917	15/5/1919
George Ritchie	9	15/5/1919	8/4/1920

LI.—BARWELL MINISTRY.

Sir H. N. Barwell ...	1-4	8/4/1920	16/4/1924
Sir J. G. Bice ... ... succeeded by	2	,,	9/11/1923
T. Pascoe, M.L.C. ...	2	14/11/1923	16/4/1924
George Ritchie ... ... succeeded by	3	8/4/1920	3/11/1922
William Hague	3	3/11/1922	16/4/1924
G. R. Laffer	8-19	8/4/1920	,,
William Hague	10-22	,,	,,
T. Pascoe, M.L.C. ...	11	,,	,,
G. F. Jenkins	23	14/11/1923	,,
John Cowan	24	,,	,,
William Hague ... ... succeeded by	9	8/4/1920	3/11/1922
T. Pascoe, M.L.C. ... succeeded by	9	3/11/1922	14/11/1923
G. F. Jenkins	9	14/11/1923	16/4/1924
George Ritchie ... ... succeeded by	14	8/4/1920	3/11/1922
T. Pascoe, M.L.C. ...	14	3/11/1922	16/4/1924
T. Pascoe, M.L.C. ... succeeded by	17	8/4/1920	3/11/1922
G. F. Jenkins ... ... succeeded by	17	3/11/1922	14/11/1923
John Cowan	17	14/11/1923	16/4/1924
T. Pascoe, M.L.C. ... succeeded by	22	8/4/1920	3/11/1922
G. R. Laffer	22	3/11/1922	16/4/1924
Sir J. G. Bice ... ... succeeded by	25	8/4/1920	9/11/1923
G. F. Jenkins	25	14/11/1923	16/4/1924
G. F. Jenkins	19a	3/11/1922	14/11/1923
John Cowan	19a	14/11/1923	16/4/1924

LII.—GUNN MINISTRY.

John Gunn	1-3	16/4/1924	28/8/1926
James Jelley	2	,,	,,
W. J. Denny	4-20	,,	,,
T. Butterfield	6-17	,,	,,
L. L. Hill	9-10-14	,,	,,
A. A. Kirkpatrick, M.L.C	7-11-23-25	,,	,,
John Gunn ... ... succeeded by	19-22	,,	29/1/1925
W. J. Denny	19-22	29/1/1925	28/8/1926
James Jelley ... ... succeeded by	21	16/4/1924	29/1/1925
John Gunn	21	29/1/1925	28/8/1926
W. J. Denny	26	16/4/1924	29/1/1925

LIII.—HILL MINISTRY.

L. L. Hill	1-3-12	28/8/1926	
J. Jelley	2	,,	
W. J. Denny	4-20-22-19	,,	
T. Butterfield	8-15	,,	
A. A. Kirkpatrick ...	11-7-23	,,	
J. McInnes	9-10-21	,,	

QUEENSLAND.

KEY TO OFFICE.

1. Premier (before 1893 sometimes Chief Sec'y).
2. Colonial—after 1893 called Chief—Secretary.
3. Treasurer (before 1893 Colonial Treasurer).
4. Attorney-general. 5. Solicitor-general.
6. Home Secretary. 7. Secretary for Railways.
8. Secretary for Public Lands.
9. Secretary for Public Works.
10. Postmaster-general. 11. Secretary for Mines.
12. Secretary for Agriculture and Stock.
13. Minister of Justice.
14. Secretary for Public Instruction.
15. Vice-president of the Executive Council.
16. Secretary for Goldfields.
17. Secretary for Agriculture.
18. Minister without Portfolio. (J. F. Garrick was appointed Agent General in 1884, but remained a M.L.C. and Minister without Portfolio.)

I.—HERBERT MINISTRY.

Name.	Office.	From—	To—
R. G. W. Herbert ...	1-2	10/12/1859	1/2/1866
Ratcliffe Pring	4	,,	30/8/1865
succeeded by			
John Bramston	4	31/8/1865	11/9/1865
succeeded by			
Charles Lilley	4	11/9/1865	1/2/1866
R. R. Mackenzie	3	15/12/1859	4/8/1862
succeeded by			
T. De Lacy Moffatt ...	3	4/8/1862	2/10/1864
succeeded by			
Joshua P. Bell	3	22/12/1864	1/2/1866
St. George R. Gore ...	8-9	14/1/1862	21/3/1862
succeeded by			
Arthur Macalister ...	8-9	21/3/1862	20/7/1866
M. C. O'Connell	18	21/5/1860	28/8/1860
J. J. Galloway	18	28/8/1860	10/11/1860
William Hobbs	18	30/4/1861	14/1/1862
John Bramston	18	3/7/1863	1/2/1866

II.—MACALISTER MINISTRY.

Arthur Macalister ...	1-8-9	1/2/1866	20/7/1866
R. R. Mackenzie	2	,,	,,
Charles Lilley	4	,,	,,
Joshua P. Bell	2	,,	,,
John Douglas	10	1/3/1866	,,
John Douglas	18	1/2/1866	28/2/1866

III.—HERBERT MINISTRY.

R. G. W. Herbert ...	1	20/7/1866	Merged in Macalister Ministry, 7/8/1866
Ratcliffe Pring	4	21/7/1866	,,
John D. McLean	3	,,	,,
G. E. Dalrymple	2	,,	,,
John Watts	8-9	,,	,,
T. L. Murray-Prior ...	10	,,	,,
George Raff	18	20/7/1866	,,

IV.—MACALISTER MINISTRY.

Arthur Macalister ...	1-2	7/8/1866	15/8/1867
Charles Lilley	4	,,	,,
John D. McLean	3	,,	16/12/1866
succeeded by			
John Douglas	3	19/12/1866	21/5/1867
succeeded by			
T. B. Stephens	3	21/5/1867	15/8/1867
Joshua P. Bell	8	7/8/1866	,,
John Watts	9	,,	3/5/1867
succeeded by			
John Douglas	9	21/5/1867	15/8/1867
St. George R. Gore ...	10	13/9/1866	,,
George Raff	18	7/8/1866	16/11/1866

V.—MACKENZIE MINISTRY.

R. R. Mackenzie	1-3	15/8/1867	25/11/1868
A. H. Palmer	2	,,	,,
Ratcliffe Pring	4	,,	,,
A. H. Palmer	9	,,	10/9/1868
succeeded by			
Arthur Hodgson	9	10/9/1868	25/11/1868
E. W. Lamb	8	15/8/1867	10/9/1868
succeeded by			
A. H. Palmer	8	10/9/1868	25/11/1868
T. L. Murray-Prior ...	10	15/8/1867	,,

VI.—LILLEY MINISTRY.

Charles Lilley	1	25/11/1868	3/5/1870
Charles Lilley	4	,,	12/11/1869
succeeded by			
Ratcliffe Pring	4	12/11/1869	3/5/1870
T. B. Stephens	2	25/11/1868	28/1/1869
succeeded by			
Arthur Hodgson	2	28/1/1869	10/11/1869
succeeded by			
Charles Lilley	2	10/11/1869	3/5/1870
T. H. Fitzgerald	3	25/11/1868	27/1/1869
succeeded by			
T. B. Stephens	3	27/1/1869	3/5/1870
Arthur Macalister ...	8	25/11/1868	28/1/1869
succeeded by			
James Taylor	8	28/1/1869	3/5/1870
Arthur Macalister ...	9	25/11/1868	,,
Arthur Macalister ...	16	28/1/1869	,,
John Douglas	10	12/12/1868	13/11/1869
succeeded by			
T. B. Stephens	10	13/11/1869	28/1/1870
succeeded by			
St. George R. Gore ...	10	28/1/1870	3/5/1870

VII.—PALMER MINISTRY.

Name.	Office.	From—	To—
Arthur H. Palmer ...	1-2	3/5/1870	8/1/1874
Robert Ramsay	3	,,	28/3/1871
succeeded by			
Joshua P. Bell	3	28/3/1871	8/1/1874
W. H. Walsh	9	3/5/1870	10/7/1873
succeeded by			
Arthur H. Palmer ...	9	10/7/1873	15/7/1873
succeeded by			
John M. Thompson ...	9	15/7/1873	8/1/1874
John M. Thompson ...	8	3/5/1870	15/7/1873
succeeded by			
C. J. Graham	8	15/7/1873	8/1/1874
John Bramston	4	3/5/1870	2/1/1874
T. L. Murray-Prior ...	10	,,	8/1/1874
Robert Ramsay	18	28/3/1871	,,

VIII.—MACALISTER MINISTRY.

Arthur Macalister ...	1-2	8/1/1874	5/6/1876
William Hemmant ...	3	,,	,,
E. O'D. MacDevitt ...	4	,,	3/8/1874
succeeded by			
S. W. Griffith	4	3/8/1874	5/6/1876
T. B. Stephens	8	8/1/1874	27/5/1875
succeeded by			
William Fryar	8	27/5/1875	5/6/1876
Thomas McIlwraith ...	9-11	8/1/1874	24/10/1874
succeeded by			
Arthur Macalister ...	9-11	24/10/1874	13/11/1874
succeeded by			
Henry E. King	9-11	13/11/1874	10/5/1876
succeeded by			
James R. Dickson ...	9-11	10/5/1876	5/6/1876
George Thorn, junior ...	10	9/1/1874	,,

IX.—THORN MINISTRY.

George Thorn	1-9-10-11	5/6/1876	Merged in Douglas Ministry, 8/3/1877
John Douglas	8	,,	,,
S. W. Griffith	4-14	,,	,,
James R. Dickson ...	3	,,	,,
R. M. Stewart	2	,,	,,
Charles S. Mein	10	8/7/1876	,,

X.—DOUGLAS MINISTRY.

John Douglas	1	8/3/1877	21/1/1879
S. W. Griffith	4	,,	7/12/1878
succeeded by			
J. F. Garrick	4	7/12/1878	21/1/1879
James R. Dickson ...	3	8/3/1877	,,
R. M. Stewart	2	,,	15/3/1877
succeeded by			
William Miles	2	15/3/1877	7/11/1877
succeeded by			
John Douglas	2	7/11/1877	21/1/1879
John Douglas	8	8/3/1877	7/11/1877
succeeded by			
George Thorn	8	7/11/1877	6/2/1878
succeeded by			
J. F. Garrick	8	6/2/1878	7/12/1878
succeeded by			
Peter McLean	8	7/12/1878	21/1/1879
S. W. Griffith	14	8/3/1877	,,
George Thorn	9	,,	7/11/1877
succeeded by			
William Miles	9	7/11/1877	21/9/1878
succeeded by			
S. W. Griffith	9	21/9/1878	21/1/1879
George Thorn	11	8/3/1877	6/2/1878
succeeded by			
J. F. Garrick	11	6/2/1878	7/12/1878
succeeded by			
Peter McLean	11	7/12/1878	21/1/1879
Charles S. Mein ...	10	8/3/1877	,,

XI.—McILWRAITH MINISTRY.

Thomas McIlwraith ...	1	21/1/1879	13/11/1883
Thomas McIlwraith ...	3	,,	5/1/1882
succeeded by			
Archibald Archer ...	3	5/1/1882	13/11/1883
Arthur H. Palmer ...	2	21/1/1879	24/12/1881
succeeded by			
Thomas McIlwraith ...	2	24/12/1881	13/11/1883
John M. Thompson ...	13	21/1/1879	16/5/1879
succeeded by			
Ratcliffe Pring	4	16/5/1879	4/6/1880
succeeded by			
Henry Rogers Beor ...	4	4/6/1880	25/12/1880
succeeded by			
P. A. Cooper	4	31/12/1880	6/1/1883
succeeded by			
C. E. Chubb	4	6/1/1883	13/11/1883
Arthur H. Palmer ...	14	21/1/1879	24/12/1881
succeeded by			
Archibald Archer ...	14	5/1/1882	13/11/1883

XI.—McILWRAITH MINISTRY (*continued*).

Name.	Office.	From—	To—
John M. Macrossan ...	9-11	21/1/1879	13/3/1883
succeeded by			
Albert Norton	9-11	13/3/1883	13/11/1883
Patrick Perkins	8	21/1/1879	,,
C. H. Buzacott	10	,,	17/12/1880
succeeded by			
Boyd D. Morehead ...	10	17/12/1880	3/8/1883
succeeded by			
F. T. Gregory	10	25/9/1883	13/11/1883

XII.—GRIFFITH MINISTRY.

Samuel W. Griffith ...	1	13/11/1883	13/6/1888
Samuel W. Griffith ...	2	,,	1/4/1886
succeeded by			
B. B. Moreton	2	1/4/1886	13/6/1888
Arthur Rutledge	4	13/11/1883	,,
James F. Garrick ...	3	,,	31/12/1883
succeeded by			
James R. Dickson ...	3	31/12/1883	17/8/1887
succeeded by			
Samuel W. Griffith ...	3	17/8/1887	13/6/1888
Samuel W. Griffith ...	14	13/11/1883	3/1/1885
succeeded by			
Charles S. Mein	14	3/1/1885	17/4/1885
succeeded by			
B. B. Moreton	14	17/4/1885	13/6/1888
Charles B. Dutton ...	8	13/11/1883	30/8/1887
succeeded by			
Henry Jordan	8	30/8/1887	13/6/1888
William Miles	9-11	13/11/1883	22/8/1887
succeeded by			
Charles B. Dutton ...	9-11	30/8/1887	12/12/1887
succeeded by			
W. O. Hodgkinson ...	9-11	12/12/1887	13/6/1888
Charles B. Dutton ...	7	,,	,,
James F. Garrick ...	10	13/11/1883	24/6/1884
succeeded by			
Charles S. Mein	10	24/6/1884	3/1/1885
succeeded by			
R. B. Sheridan	10	3/1/1885	17/2/1885
succeeded by			
Samuel W. Griffith ...	10	17/2/1885	17/3/1885
succeeded by			
B. B. Moreton	10	17/3/1885	22/4/1885
succeeded by			
T. MacDonald-Paterson ...	10	22/4/1885	11/8/1887
succeeded by			
W. H. Wilson	10	18/8/1887	13/6/1888
R. B. Sheridan	18	13/11/1883	3/1/1885
James F. Garrick, M.L.C.	18	24/6/1884	13/6/1888

XIII.—McILWRAITH MINISTRY.

Sir T. Mcllwraith... ...	1-3	13/6/1888	30/11/1888
Boyd D. Morehead ...	2	,,	,,
John M. Macrossan ...	9-11	,,	,,
A. J. Thynne	13	,,	,,
Maurice H. Black ...	8	,,	,,
Hugh M. Nelson	7	,,	,,
John Donaldson	10-14	,,	,,
William Pattison ...	18	,,	,,

XIV.—MOREHEAD MINISTRY.

Boyd D. Morehead ...	1	30/11/1888	12/8/1890
Boyd D. Morehead ...	2	,,	4/1/1890
succeeded by			
John M. Macrossan ...	2	4/1/1890	12/8/1890
William Pattison ...	2	30/11/1888	19/11/1889
succeeded by			
John Donaldson	3	19/11/1889	12/8/1890
Andrew J. Thynne ...	13	30/11/1888	,,
Maurice H. Black ...	8	,,	,,
Hugh M. Nelson	7	,,	,,
J. M. Macrossan	9	,,	4/1/1890
succeeded by			
Hugh M. Nelson	9	4/1/1890	12/8/1890
J. M. Macrossan	11	30/11/1888	,,
John Donaldson	10-14	,,	19/11/1889
succeeded by			
Charles Powers	10-14	19/11/1889	12/8/1890
Sir T. Mcllwraith... ...	18	30/11/1888	17/9/1889
Charles Powers	18	20/9/1889	19/11/1889
William Pattison ...	18	19/11/1889	12/8/1890

XV.—GRIFFITH MINISTRY.

Sir S. W. Griffith ...	1	12/8/1890	13/3/1893
succeeded by			
Sir T. Mcllwraith... ...	1	13/3/1893	27/3/1893
Sir S. W. Griffith ...	4	12/8/1890	13/3/1893
succeeded by			
T. J. Byrnes	4	13/3/1893	27/3/1893
Sir T. Mcllwraith... ...	3	12/8/1890	,,
T. J. Byrnes	5	,,	13/3/1893
Horace Tozer	2-9	,,	27/3/1893
A. S. Cowley	8-17	,,	,,
Theodore Unmack ...	7-10	,,	,,
W. O. Hodgkinson ...	11-14	,,	,,
Hugh M. Nelson	15	13/3/1893	,,

XVI.—McILWRAITH-NELSON MINISTRY.

Name.	Office.	From—	To—
Sir T. Mcllwraith... ...	1-7-15	27/3/1893	27/10/1893
Hugh M. Nelson	3-15	,,	,,
T. J. Byrnes	4	,,	,,
Horace Tozer	2	,,	,,
W. H. Wilson	10-14	,,	,,
Isidor Lissner	11	,,	25/5/1893
Isidor Lissner	9	25/5/1893	27/10/1893
A. H. Barlow	8-17	27/3/1893	,,
A. J. Thynne	18	27/5/1893	,,

XVII.—NELSON MINISTRY.

Hugh M. Nelson	1	27/10/1893	13/4/1898
Hugh M. Nelson	3	,,	2/3/1898
succeeded by			
Robert Philp	3	2/3/1898	13/4/1898
Sir T. Mcllwraith... ...	2	27/10/1893	29/3/1895
succeeded by			
Hugh M. Nelson	2	29/3/1895	13/4/1898
T. J. Byrnes	4	27/10/1893	,,
Horace Tozer	6	,,	2/3/1898
succeeded by			
James R. Dickson ...	6	2/3/1898	13/4/1898
Hugh M. Nelson	15	27/10/1893	,,
Robert Philp	11	,,	,,
W. H. Wilson	14	,,	23/8/1894
succeeded by			
Robert Philp	14	23/8/1894	29/3/1895
succeeded by			
D. H. Dalrymple ...	14	29/3/1895	13/4/1898
Sir T. Mcllwraith ...	7	27/10/1893	29/3/1895
succeeded by			
Robert Philp	7	29/3/1895	25/2/1897
succeeded by			
James R. Dickson ...	7	25/2/1897	13/4/1898
Robert Philp	9	27/10/1893	6/5/1896
succeeded by			
D. H. Dalrymple ...	9	6/5/1896	13/4/1898
A. H. Barlow, M.L.C. ...	8	27/10/1893	6/5/1896
succeeded by			
J. F. G. Foxton	8	6/5/1896	13/4/1898
A. H. Barlow, M.L.C. ...	17	27/10/1893	6/5/1896
succeeded by			
A. J. Thynne, M.L.C. ...	17	6/5/1896	2/3/1898
succeeded by			
James V. Chataway ...	17	2/3/1898	13/4/1898
W. H. Wilson, M.L.C. ...	10	27/10/1893	3/10/1894
succeeded by			
A. J. Thynne, M.L.C. ...	10	3/10/1894	31/3/1897
succeeded by			
James R. Dickson ...	10	31/3/1897	2/3/1898
succeeded by			
W. H. Wilson, M.L.C. ...	10	2/3/1898	13/4/1898
A. J. Thynne, M.L.C. ...	18	27/10/1893	3/10/1894
W. H. Wilson, M.L.C. ...	18	3/10/1894	2/3/1898
Sir T. Mcllwraith... ...	18	29/3/1895	9/12/1897
A. H. Barlow, M.L.C. ...	18	6/5/1896	13/4/1898

XVIII.—BYRNES MINISTRY.

T. J. Byrnes	1-2-4-15	13/4/1898	27/9/1898
succeeded by			
James R. Dickson ...	1	27/9/1898	1/10/1898
James R. Dickson ...	6	13/4/1898	,,
Robert Philp	3-11	,,	,,
D. H. Dalrymple ...	14	,,	,,
James R. Dickson ...	7	,,	27/4/1898
succeeded by			
John Murray	7	27/4/1898	1/10/1898
D. H. Dalrymple ...	9	13/4/1898	27/4/1898
succeeded by			
John Murray	9	27/4/1898	1/10/1898
J. F. G. Foxton	8	13/4/1898	,,
J. V. Chataway	17	,,	,,
W. H. Wilson, M.L.C. ...	10	,,	,,
A. H. Barlow, M.L.C. ...	18	,,	,,

XIX.—DICKSON MINISTRY.

James R. Dickson ...	1-2-15	1/10/1898	1/12/1899
J. F. G. Foxton	6	,,	,,
Robert Philp	3-11	,,	,,
W. H. Wilson, M.L.C. ...	10-13	,,	28/3/1899
Arthur Rutledge	4	28/3/1899	1/12/1899
D. H. Dalrymple ...	14	1/10/1898	28/3/1899
succeeded by			
W. H. Wilson, M.L.C. ...	14	28/3/1899	1/12/1899
J. V. Chataway	8	1/10/1898	28/3/1899
succeeded by			
D. H. Dalrymple ...	8	28/3/1899	1/12/1899
J. V. Chataway	17	1/10/1898	,,
John Murray	7-9	,,	,,
A. H. Barlow, M.L.C. ...	18	,,	11/9/1899
G. W. Gray, M.L.C. ...	18	12/10/1898	1/12/1899

XX.—DAWSON MINISTRY.

Name.	Office.	From—	To—
Anderson Dawson ...	1-2-15	1/12/1899	7/12/1899
C. B. Fitzgerald	4	,,	,,
Henry Turley	6	,,	,,
William Kidston	3-10	,,	,,
W. H. Browne	11-11	,,	,,
H. F. Hardacre	8-17	,,	,,
Andrew Fisher	7-9	,,	,,

XXI.—PHILP MINISTRY.

Robert Philp	1-11	7/12/1899	17/9/1903
Robert Philp	3	,,	1/2/1901
succeeded by			
Thomas Bridson Cribb ...	3	1/2/1901	17/9/1903
Arthur Rutledge	4	7/12/1899	,,
James R. Dickson ...	2	,,	10/1/1901
succeeded by			
Robert Philp	2	1/2/1901	17/9/1903
James R. Dickson ...	15	7/12/1899	10/1/1901
succeeded by			
Robert Philp	15	1/2/1901	12/8/1902
succeeded by			
John Murray, M.L.C. ...	15	12/8/1902	17/9/1903
J. F. G. Foxton	6	7/12/1899	8/4/1903
succeeded by			
Robert Philp	6	8/4/1903	17/9/1903
W. B. H. O'Connell ...	8	7/12/1899	4/3/1903
succeeded by			
J. F. G. Foxton	8	8/4/1903	17/9/1903
John Murray	7-9	7/12/1899	1/2/1901
succeeded by			
John Leahy	7-9	1/2/1901	17/9/1903
J. V. Chataway	17	7/12/1899	12/4/1901
succeeded by			
D. H. Dalrymple ...	17	1/5/1901	17/9/1903
J. G. Drake, M.L.C. ...	10	7/12/1899	1/2/1901
succeeded by			
John Murray	10	1/2/1901	1/3/1901
J. G. Drake, M.L.C. ...	14	7/12/1899	1/2/1901
succeeded by			
John Murray	14	1/2/1901	12/8/1902
succeeded by			
D. H. Dalrymple ...	14	12/8/1902	17/9/1903
D. H. Dalrymple ...	18	7/12/1899	1/5/1901
G. W. Gray, M.L.C. ...	18	,,	17/9/1903

XXII.—MORGAN MINISTRY.

Arthur Morgan	1-2-7-15	17/9/1903	19/1/1906
A. H. Barlow, M.L.C. ...	14	,,	,,
William Kidston	3	,,	,,
J. W. Blair	4	,,	,,
J. T. Bell	8	,,	,,
W. H. Browne	11	,,	12/4/1904
succeeded by			
Peter Airey	11	19/4/1904	27/4/1904
succeeded by			
J. W. Blair	11	27/4/1904	19/1/1906
W. H. Browne	9	17/9/1903	12/4/1904
succeeded by			
Peter Airey	9	19/4/1904	27/4/1904
succeeded by			
D. F. Denham	9	27/4/1904	19/1/1906
D. F. Denham	6	17/9/1903	27/4/1904
succeeded by			
Peter Airey	6	27/4/1904	19/1/1906
D. F. Denham	17	17/9/1903	,,
T. O'Sullivan, M.L.C. ...	18	24/9/1903	,,

XXIII.—KIDSTON MINISTRY.

William Kidston	1-2-3-15	19/1/1906	19/11/1907
A. H. Barlow, M.L.C. ...	14	,,	,,
J. W. Blair	4-11	,,	,,
J. T. Bell	8	,,	,,
T. O'Sullivan	9	,,	,,
D. F. Denham	17	,,	4/2/1907
succeeded by			
T. O'Sullivan	17	6/2/1907	19/11/1907
D. F. Denham	7	19/1/1906	4/2/1907
succeeded by			
J. T. Bell	7	6/2/1907	3/7/1907
succeeded by			
George Kerr	7	3/7/1907	19/11/1907
Peter Airey	6	19/1/1906	3/7/1907
succeeded by			
A. G. C. Hawthorn ...	6	3/7/1907	19/11/1907
Peter Airey, M.L.C. ...	18	,,	,,

XXIV.—PHILP MINISTRY.

Robert Philp	1-2-3-15	19/11/1907	18/2/1908
D. F. Denham	6	,,	,,
W. H. Barnes	8	,,	,,
J. D. Campbell	7	,,	,,
P. J. Leahy	9-11	,,	,,
F. I. Power, M.L.C. ...	13	,,	,,
William Stephens... ...	17-14	,,	,,
W. V. Brown, M.L.C. ...	18	,,	,,

XXV.—KIDSTON (COALITION) MINISTRY.

Name.	Office.	From—	To—
William Kidston	1-2-15	18/2/1908	7/2/1911
A. H. Barlow, M.L.C. ...	14	,,	29/6/1909
succeeded by			
W. H. Barnes	14	29/6/1909	7/2/1911
J. W. Blair	4	18/2/1908	29/10/1908
succeeded by			
T. O'Sullivan, M.L.C. ...	4	29/10/1908	7/2/1911
J. W. Blair	11	18/2/1908	29/10/1908
succeeded by			
J. G. Appel	11	29/10/1908	29/6/1909
succeeded by			
George Jackson	11	29/6/1909	22/10/1909
succeeded by			
J. G. Appel	11	22/10/1909	7/2/1911
J. T. Bell	8	18/2/1908	29/10/1908
succeeded by			
D. F. Denham	8	29/10/1908	7/2/1911
Peter Airey	3	18/2/1908	29/10/1908
succeeded by			
A. G. C. Hawthorn ...	3	29/10/1908	7/2/1911
A. G. C. Hawthorn ...	6	18/2/1908	29/10/1908
succeeded by			
J. T. Bell	6	29/10/1908	29/6/1909
succeeded by			
J. G. Appel	6	29/6/1908	7/2/1911
T. O'Sullivan, M.L.C. ...	17	18/2/1908	29/10/1908
succeeded by			
W. T. Paget	17	29/10/1908	7/2/1911
George Kerr	9	18/2/1908	29/10/1908
succeeded by			
J. G. Appel	9	29/10/1908	29/6/1909
succeeded by			
George Jackson	9	29/6/1909	22/10/1909
succeeded by			
W. H. Barnes	9	22/10/1909	7/2/1911
George Kerr	7	18/2/1908	29/10/1908
succeeded by			
W. T. Paget	7	29/10/1908	7/2/1911
A. H. Barlow, M.L.C. ...	18	29/6/1909	,,

XXVI.—DENHAM MINISTRY.

D. F. Denham	1-2-15	7/2/1911	1/6/1915
T. O'Sullivan, M.L.C. ...	4	,,	,,
W. H. Barnes	3-9	,,	,,
John G. Appel	6-11	,,	26/2/1915
succeeded by			
K. McDonald Grant ...	6-11	26/2/1915	1/6/1915
K. McDonald Grant ...	14	7/2/1911	3/9/1912
succeeded by			
J. W. Blair	14	3/9/1912	1/6/1915
W. T. Paget	7	7/2/1911	6/4/1915
succeeded by			
C. D. W. Rankin	7	6/4/1915	1/6/1915
E. H. Macartney	8	7/2/1911	11/12/1912
succeeded by			
James Tolmie	8	11/12/1912	1/6/1915
James Tolmie	17	7/2/1911	11/12/1912
succeeded by			
John White	17	11/12/1912	1/6/1915
A. H. Barlow, M.L.C. ...	18	7/2/1911	,,
H. A. Douglas	18	6/4/1915	,,

XXVII.—RYAN MINISTRY.

T. J. Ryan	1-2-4	1/6/1915	22/10/1919
E. G. Theodore	3-9	,,	,,
David Bowman	6	,,	25/2/1916
succeeded by			
T. J. Ryan	6	10/3/1916	23/3/1916
succeeded by			
John Huxham	6	23/3/1916	9/9/1919
succeeded by			
William McCormack ...	6	9/9/1919	22/10/1919
T. J. Ryan	11	1/6/1915	10/7/1915
succeeded by			
W. Hamilton, M.L.C. ...	11	10/7/1915	15/2/1917
succeeded by			
A. J. Jones, M.L.C. ...	11	15/2/1917	22/10/1919
T. J. Ryan	15	1/6/1915	30/4/1918
succeeded by			
J. McEwan Hunter ...	15	30/4/1918	22/10/1919
John Adamson	7	1/6/1915	2/10/1916
succeeded by			
T. J. Ryan	7	2/10/1916	13/10/1916
succeeded by			
J. H. Coyne	7	13/10/1916	30/4/1918
succeeded by			
J. A. Fihelly	7	30/4/1918	22/10/1919
William Lennon	12	1/6/1915	9/9/1919
succeeded by			
W. N. Gillies	12	9/9/1919	22/10/1919
J. McEwan Hunter ...	8	1/6/1915	30/4/1918
succeeded by			
J. H. Coyne	8	30/4/1918	22/10/1919
H. F. Hardacre	14	1/6/1915	9/9/1919
succeeded by			
John Huxham	14	9/9/1919	22/10/1919

XXVII.—RYAN MINISTRY (*continued*).

Name.	Office.	From—	To—
W. Hamilton, M.L.C. ...	18	8/6/1915	10/7/1915
John Huxham	18	10/7/1915	23/3/1916
J. A. Fihelly	18	,,	30/4/1918
W. N. Gillies	18	26/4/1918	9/9/1919
James Larcombe	18	9/9/1919	22/10/1919

XXVIII.—THEODORE MINISTRY.

E. G. Theodore	1-2-15	22/10/1919	26/2/1925
E. G. Theodore	3	,,	9/3/1920
succeeded by			
J. A. Fihelly	3	9/3/1920	8/2/1922
succeeded by			
E. G. Theodore	3	8/2/1922	26/2/1925
J. A. Fihelly	13	22/10/1919	7/4/1920
J. A. Fihelly	4	7/4/1920	12/11/1920
succeeded by			
John Mullan	4	12/11/1920	26/2/1925
William McCormack ...	6	22/10/1919	2/7/1923
succeeded by			
James Stopford	6	2/7/1923	26/2/1925
J. A. Fihelly	7	22/10/1919	7/4/1920
succeeded by			
James Larcombe	7	7/4/1920	26/2/1925
A. J. Jones	11	22/10/1919	,,
W. N. Gillies	12	,,	,,
J. H. Coyne	8	,,	12/11/1920
succeeded by			
E. G. Theodore	8	12/11/1920	16/12/1920
succeeded by			
J. H. Coyne	8	16/12/1920	2/7/1923
succeeded by			
William McCormack ...	8	2/7/1923	26/2/1925
John Huxham	14	22/10/1919	14/7/1924
succeeded by			
F. T. Brennan	14	14/7/1924	26/2/1925
James Larcombe	9	22/10/1919	7/4/1920
succeeded by			
J. A. Fihelly	9	7/4/1920	8/2/1922
succeeded by			
E. G. Theodore	9	8/2/1922	6/10/1922
succeeded by			
W. F. Smith	9	6/10/1922	26/2/1925
John Mullan	18	22/10/1919	12/11/1920
W. F. Smith	18	16/12/1920	6/10/1922
James Stopford	18	6/10/1922	2/7/1923
F. T. Brennan	18	2/7/1923	14/7/1924
M. J. Kirwan	18	14/7/1924	26/2 1925

XXIX.—GILLIES MINISTRY.

W. N. Gillies	1-2-3-15	26/2/1925	22/10/1925
William McCormack ...	8	,,	,,
A. J. Jones	11	,,	,,
John Mullan	4	,,	,,
James Larcombe	7	,,	,,
W. F. Smith	12	,,	,,
James Stopford	6	,,	,,
M. J. Kirwan	9	,,	,,
Thomas Wilson	14	,,	,,
Thomas Dunstan ...	18	,,	,,

XXX.—McCORMACK MINISTRY.

William McCormack ...	1-2-3-15	22/10/1925
W. F. Smith	12	,,
A. J. Jones	11	,,
John Mullan	4	,,
James Larcombe	7	,,
James Stopford	6	,,
M. J Kirwan	9	,,
Thomas Wilson	14	,,
Thomas Dunstan ...	8	,,
D. A. Gledson	18	,,

WESTERN AUSTRALIA.

KEY TO OFFICE.

1. Premier.
2. Colonial Secretary.
3. Treasurer.
4. Attorney-general.
5. Minister for the North West.
6. Commissioner of Crown Lands.
7. Minister for Immigration.
8. Minister for Lands.
9. Minister for Works.
10. Minister for Mines and Railways.
11. Minister for Mines.
12. Commissioner of Railways and Director of Public Works.

KEY TO OFFICE (*continued*).

13. Minister for Justice, afterwards Justice and Police.
14. Minister of Education.
15. Minister for Industries.
16. Representative of Government in the Legislative Council.
17. Minister of Agriculture.
18. Minister for Water-supply, Sewerage and Drainage.
19. Minister for Repatriation.
20. Minister for Public Health.
21. Minister for Labour, afterwards Commerce and Labour.
22. Minister for Railways (sometimes called Commissioner).
23. Minister for Works and Trading Concerns.
24. Minister for State Trading Concerns.
25. Minister for Forests.
26. Minister for Woods and Forests.
27. Minister without Portfolio, (sometimes called Honorary Minister).

I.—FORREST MINISTRY.

Name.	Office.	From—	To—
John Forrest	1-3	29/12/1890	15/2/190 1
G. Shenton, M.L.C. ...	2	,,	11/10/1892
succeeded by			
S. H. Parker, M.L.C. ...	2	11/10/1892	4/12/1894
succeeded by			
John Forrest	2	4/12/1894	28/4/1898
succeeded by			
G. Randell, M.L.C. ...	2	28/4/1898	15/2/1901
Septimus Burt	4	29/12/1890	27/10/1897
succeeded by			
R. W. Pennefather ...	4	27/10/1897	15/2/1901
W. E. Marmion	6	29/12/1890	4/12/1894
succeeded by			
A. R. Richardson... ...	6	4/12/1894	13/3/1897
succeeded by			
George Throssell	6	13/3/1897	15/2/1901
Harry W. Venn	12	29/12/1890	10/3/1896
succeeded by			
F. H. Piesse	12	1/4/1896	23/8/1900
succeeded by			
B. C. Wood	12	10/9/1900	15/2/1901
E. H. Wittenoom, M.L.C.	11	19/12/1894	28/4/1898
succeeded by			
Henry B. Lefroy	11	28/4/1898	15/2/1901
E. H. Wittenoom, M.L.C.	14	19/12/1894	12/5/1897
succeeded by			
Henry B. Lefroy	14	12/5/1897	28/4/1898
succeeded by			
G. Randell, M.L.C. ...	14	28/4/1898	15/2/1901
G. Randell, M.L.C. ...	16	,,	,,
Septimus Burt	27	27/10/1897	,,

II.—THROSSELL MINISTRY.

George Throssell	1-3	15/2/1901	27/5/1901
B. C. Wood	12	,,	,,
C. J. Moran	6	,,	,,
Henry B. Lefroy	11	,,	,,
R. W. Pennefather ...	4	,,	20/3/1901
succeeded by			
William F. Sayer ...	4	25/3/1901	27/5/1901
G. Randell, M.L.C. ...	2-14	15/2/1901	,,

III.—LEAKE MINISTRY.

George Leake	1-4	27/5/1901	21/11/1901
F. Illingworth	2-3	,,	,,
Walter Kingsmill ...	9	,,	,,
C. Sommers, M.L.C. ...	8	,,	,,
J. J. Holmes	22	,,	,,
Henry Gregory	11	,,	,,
A. Jameson, M.L.C. ...	27	28/6/1901	,,
Walter H. James ...	27	,,	,,

IV.—MORGANS MINISTRY.

A. E. Morgans	1-3	21/11/1901	23/12/1901
F. W. Moorhead	4	,,	,,
Frank Wilson	10	,,	,,
T. F. Quinlan	9	,,	,,
John L. Nanson	8	,,	,,
M. L. Moss, M.L.C. ...	2	,,	,,

V.—LEAKE MINISTRY.

Name.	Office.	From—	To—
George Leake	1-4	23/12/1901	24/6/1902
succeeded by			
F. Illingworth	1	24/6/1902	1/7/1902
Walter Kingsmill ...	22	23/12/1901	,,
F. Illingworth	2-3	,,	,,
Henry Gregory	11	,,	,,
A. Jameson, M.L.C. ...	8	,,	,,
C. H. Rason	9	,,	,,
J. J. Holmes	27	,,	,,
E. M. Clarke, M.L.C. ...	27	,,	,,

VI.—JAMES MINISTRY.

W. H. James	1-4	1/7/1902	10/8/1904
W. Kingsmill, M.L.C. ...	2-14	,,	,,
Henry Gregory	11	,,	,,
A. Jameson, M.L.C. ...	8	,,	23/1/1903
succeeded by			
J. M. Hopkins	8	17/2/1903	10/8/1904
C. H. Rason	9	1/7/1902	28/4/1904
succeeded by			
J. L. Nanson	9	28/4/1904	10/8/1904
C. H. Rason	22	1/7/1902	,,
James Gardiner	3	,,	20/4/1904
succeeded by			
C. H. Rason	3	20/4/1904	10/8/1904
M. L. Moss, M.L.C. ...	27	13/8/1902	10/3/1904
J. L. Nanson	27	25/1/1904	28/4/1904

VII.—DAGLISH MINISTRY.

Henry Daglish	1-3	10/8/1904	25/8/1905
Henry Daglish	14	,,	7/6/1905
succeeded by			
T. H. Bath	14	7/6/1905	25/8/1905
Robert Hastie	13	10/8/1904	,,
Robert Hastie	11	,,	7/6/1905
succeeded by			
W. D. Johnson	11	7/6/1905	25/8/1905
J. M. Drew, M.L.C. ...	8	10/8/1904	7/6/1905
succeeded by			
T. H. Bath	8	7/6/1905	25/8/1905
W. D. Johnson	9	10/8/1904	7/6/1905
succeeded by			
P. J. Lynch	9	7/6/1905	25/8/1905
George Taylor	2	10/8/1904	7/6/1905
succeeded by			
J. M. Drew, M.L.C. ...	2-17	7/6/1905	25/8/1905
J. B. Holman	22	10/8/1904	7/6/1905
succeeded by			
W. D. Johnson	22	7/6/1905	25/8/1905
J. B. Holman	21	10/8/1904	7/6/1905
succeeded by			
Robert Hastie	21	7/6/1905	25/8/1905
W. C. Angwin	27	10/8/1904	,,

VIII.—RASON MINISTRY.

C. H. Rason	1-3-13	25/8/1905	7/5/1906
W. Kingsmill, M.L.C. ...	2-14	,,	,,
Henry Gregory	10	,,	,,
Frank Wilson	9	,,	,,
N. J. Moore	8-17	,,	,,
J. S. Hicks	21	,,	,,
M. L. Moss, M.L.C. ...	27	,,	,,

IX.—MOORE MINISTRY.

N. J. Moore	1	7/5/1906	16/9/1910
N. J. Moore	8	,,	30/6/1909
succeeded by			
James Mitchell	8	30/6/1909	16/9/1910
Frank Wilson	3	7/5/1906	30/6/1909
succeeded by			
N. J. Moore	3	30/6/1909	16/9/1910
Frank Wilson	17	7/5/1906	30/6/1909
succeeded by			
James Mitchell	17	30/6/1909	16/9/1910
Frank Wilson	14	7/5/1906	14/5/1909
succeeded by			
John L. Nanson	14	30/6/1909	16/9/1910
Henry Gregory	10	7/5/1906	,,
J. D. Connolly, M.L.C. ...	2-21	,,	,,
James Price	9	,,	30/6/1909
succeeded by			
Frank Wilson	9	30/6/1909	16/9/1910
Norbert Keenan	4	14/5/1906	14/5/1909
John L. Nanson	4	30/6/1909	16/9/1910
N. J. Moore	13	14/5/1909	30/6/1909
James Mitchell	27	8/1/1906	,,
C. S. Piesse, M.L.C. ...	27	—/6/1906	—/3/1909
John L. Nanson	27	14/5/1909	30/6/1909
James Price	27	30/6/1909	16/9/1910

X.—WILSON MINISTRY.

Name.	Office.	From—	To—
Frank Wilson	1-3	16/9/1910	7/10/1911
Henry Gregory	10	,,	,,
James Mitchell	8-15-17	,,	,,
J. D. Connolly, M.L.C. ...	2	,,	,,
John L. Nanson	4-14	,,	,,
Henry Daglish	9	,,	,,
R. D. McKenzie, M.L.C.	27	,,	,,
Arthur Male	27	,,	,,

XI.—SCADDAN MINISTRY.

John Scaddan	1-3	7/10/1911	27/7/1916
T. H. Bath	8-17	,,	23/11/1914
succeeded by			
W. D. Johnson	8-17	23/11/1914	27/7/1916
P. Collier	11	7/10/1911	,,
P. Collier	22	,,	23/11/1914
succeeded by			
John Scaddan	11	23/11/1914	27/7/1916
W. D. Johnson	9	7/10/1911	23/11/1914
succeeded by			
W. C. Angwin	9-15	23/11/1914	27/7/1916
Thomas Walker	4-14	7/10/1911	,,
J. M. Drew, M.L.C. ...	2	,,	,,
P. Collier	18	23/11/1914	,,
W. C. Angwin	27	7/10/1911	23/11/1914
J. E. Dodd, M.L.C. ...	27	,,	27/7/1916
R. H. Underwood ...	27	23/11/1914	,,

XII.—WILSON MINISTRY.

Frank Wilson	1-3	27/7/1916	28/6/1917
H. B. Lefroy	8-17	,,	,,
James Mitchell	15-18-22	,,	,,
H. P. Colebatch, M.L.C.	2-14	,,	,,
W. J. George	23	,,	,,
R. T. Robinson	4-11	,,	,,
J. D. Connolly	27	,,	,,
A. J. H. Saw, M.L.C. ...	27	,,	,,

XIII.—LEFROY MINISTRY.

H. B. Lefroy	1-8-17	28/6/1917	17/4/1919
H. P. Colebatch, M.L.C.	2-14	,,	,,
W. J. George	18-23	,,	,,
R. T. Robinson	4-15-26	,,	,,
James Gardiner	3	,,	2/4/1919
succeeded by			
H. B. Lefroy	3	2/4/1919	17/4/1919
John Scaddan	10	28/6/1917	27/7/1917
succeeded by			
C. A. Hudson	10	27/7/1917	17/4/1919
W. L. Thomas	27	28/6/1917	26/9/1917
F. E. S. Willmott ...	27	,,	17/4/1919
C. F. Baxter, M.L.C. ...	27	,,	,,
R. H. Underwood ...	27	23/11/1917	26/3/1919

XIV.—COLEBATCH MINISTRY.

H. P. Colebatch, M.L.C.	1-3-14-22	17/4/1919	17/5/1919
James Mitchell	8-19	,,	,,
W. J. George	18-23	,,	,,
R. T. Robinson	4-11-15-25	,,	,,
C. A. Hudson	2	,,	,,
C. F. Baxter, M.L.C. ...	17	,,	,,
F. E. S. Willmott ...	27	,,	,,

XV.—MITCHELL MINISTRY.

Sir James Mitchell ...	1-3-8-19	17/5/1919	16/4/1924
H. P. Colebatch, M.L.C.	20	,,	12/4/1921
succeeded by			
F. T. Broun	20	13/4/1921	21/8/1922
succeeded by			
R. S. Sampson	20	22/8/1922	16/4/1924
H. P. Colebatch, M.L.C.	14	17/5/1919	17/6/1923
succeeded by			
John Ewing, M.L.C. ...	14	18/6/1923	16/4/1924
H. P. Colebatch, M.L.C.	17	17/5/1919	12/4/1921
succeeded by			
H. K. Maley	17	13/4/1921	16/4/1924
H. P. Colebatch, M.L.C.	5-13	12/4/1921	17/6/1923
succeeded by			
John Ewing, M.L.C. ...	5-13	18/6/1923	16/4/1924
W. J. George	9-18-23	17/5/1919	,,
R. T. Robinson	11-15-25	,,	21/6/1919
succeeded by			
John Scaddan	11-15-25	26/6/1919	16/4/1924
John Scaddan	2	17/5/1919	25/6/1919
succeeded by			
F. T. Broun	2	25/6/1919	21/8/1922
succeeded by			
R. S. Sampson	2	22/8/1922	16/4/1924
John Scaddan	22	17/5/1919	,,
T. P. Draper	4	,,	4/4/1921
F. E. S. Willmott ...	27	,,	13/4/1921
C. F. Baxter, M.L.C. ...	27	,,	,,

XVI.—COLLIER MINISTRY.

Name.	Office.	From—	To—
Philip Collier	1-3-25	17/4/1924	
W. C. Angwin	7-8-15	,,	
M. F. Troy	11-17	,,	
J. C. Willcock	13-22	,,	
A. McCallum	9-18-21-24	,,	
J. L. Drew, M.L.C. ...	2-5-14-20	,,	
S. W. Munsie	27	,,	
James Cunningham ...	27	,,	
J. W. Hickey, M.L.C. ...	27	,,	

TASMANIA.

KEY TO OFFICE.

1. Premier.
2. Colonial Secretary (from 1879 onwards, Chief Secretary).
3. Colonial Treasurer.
4. Attorney-general.
5. Solicitor-general.
6. Commissioner of Crown Lands.
7. Minister for Railways.
8. Minister for Lands.
9. Minister for Works.
10. Secretary of Lands and Works (afterwards Minister).
11. Minister for Mines.
12. Minister for Agriculture.
13. Minister for Forestry.
14. Minister for Education.
15. Director of Public Works.
16. Seat in Executive Council without office.
17. Minister without Portfolio.

I.—CHAMP MINISTRY.

Name.	Office.	From—	To—
W. T. N. Champ	1-2	1/11/1856	26/2/1857
T. D. Chapman	3	,,	,,
Francis Smith	4	,,	,,
John W. Rogers	5	15/12/1856	,,
H. F. Anstey	10	1/11/1856	,,
W. E. Nairn	16	,,	,,

II.—GREGSON MINISTRY.

T. G. Gregson	1-2	26/2/1857	25/4/1857
Charles Meredith	3	,,	,,
John C. Gregson	4	,,	,,
James Whyte	16	,,	,,
Maxwell Miller	16	,,	,,
John H. Wedge	16	,,	,,

III.—WESTON MINISTRY.

W. P. Weston	1	25/4/1857	12/5/1857
William Henty	2	,,	,,
F. M. Innes	3	,,	,,
Francis Smith	4	,,	,,
T. J. Knight	5	,,	,,
R. Q. Kermode	16	,,	,,

IV.—SMITH MINISTRY.

Francis Smith	1-4	12/5/1857	1/11/1860
William Henty	2	,,	,,
F. M. Innes	3	,,	,,
Thomas J. Knight ...	5	,,	,,
R. Q. Kermode	16	,,	,,
W. P. Weston	16	,,	,,
John Walker	16	,,	,,

V.—WESTON MINISTRY.

W. P. Weston	1	1/11/1860	2/8/1861
William Henty	2	,,	,,
F. M. Innes	3	,,	,,
Thomas J. Knight ...	4	2/11/1860	4/2/1861
succeeded by			
William L. Dobson ...	4	5/2/1861	2/8/1861
William Archer	16	2/11/1860	,,

VI.—CHAPMAN MINISTRY.

T. D. Chapman	1	2/8/1861	20/1/1863
William Henty	2	,,	1/11/1862
succeeded by			
F. M. Innes	2	1/11/1862	20/1/1863
F. M. Innes	3	2/8/1861	1/11/1862
succeeded by			
T. D. Chapman	3	1/11/1862	20/1/1863
W. L. Dobson	4	2/8/1861	,,

VII.—WHYTE MINISTRY.

Name.	Office.	From—	To—
James Whyte	1-2	20/1/1863	24/11/1866
Charles Meredith	3	,,	,,
Robert B. Miller	4	,,	,,
James M. Wilson ...	16	,,	,,

VIII.—DRY MINISTRY.

Sir Richard Dry	1-2	24/11/1866	1/8/1869
T. D. Chapman	3	,,	4/8/1869
W. L. Dobson	4	,,	,,

IX.—WILSON MINISTRY.

James M. Wilson ...	1-2	4/8/1869	4/11/1872
T. D. Chapman	3	,,	,,
W. L. Dobson	4	,,	5/2/1870
succeeded by			
W. R. Giblin	4	5/2/1870	4/11/1872
Henry Butler	10	27/10/1869	4/11/1872
Henry Butler	16	5/8/1869	26/10/1869
James A. Dunn	16	,,	4/11/1872

X.—INNES MINISTRY.

F. M. Innes	1-3	4/11/1872	4/8/1873
James R. Scott	2	,,	,,
John A. Jackson	4	,,	,,
Charles Meredith	10	,,	,,

XI.—KENNERLEY MINISTRY.

Alfred Kennerley ...	1	4/8/1873	20/7/1876
T. D. Chapman	2	,,	1/4/1876
succeeded by			
George Gilmore	2	10/4/1876	20/7/1876
Philip O. Fysh	3	4/8/1873	13/3/1875
succeeded by			
F. M. Innes	3	13/3/1875	20/7/1876
W. R. Giblin	4	4/8/1873	,,
William Moore	10	,,	,,

XII.—REIBEY MINISTRY.

Thomas Reibey	1-2	20/7/1876	9/8/1877
Charles Meredith	3	,,	,,
Charles Meredith	10	21/7/1876	21/8/1876
succeeded by			
C. O'Reilly	10	21/8/1876	9/8/1877
C. H. Bromby	4	20/7/1876	,,
W. L. Crowther	16	,,	,,

XIII.—FYSH MINISTRY, MERGED IN GIBLIN MINISTRY.

P. O. Fysh	1	9/8/1877	5/3/1878
succeeded by			
W. R. Giblin	1	5/3/1878	20/12/1878
W. R. Giblin	4	9/8/1877	13/8/1877
succeeded by			
Alfred Dobson	4	13/8/1877	20/12/1878
W. R. Giblin	3	,,	,,
William Moore	2	,,	,,
William Moore	10	9/8/1877	13/8/1877
succeeded by			
N. J. Brown	10	13/8/1877	20/12/1878
James W. Agnew ...	16	9/8/1877	

XIV.—CROWTHER MINISTRY.

W. L. Crowther	1	20/12/1878	29/10/1879
Thomas Reibey	2	,,	,,
David Lewis	3	,,	,,
John S. Dodds	4	,,	,,
C. O'Reilly	10	,,	,,

XV.—GIBLIN MINISTRY.

W. R. Giblin	1	30/10/1879	15/8/1884
W. R. Giblin	3	,,	1/12/1881
succeeded by			
J. S. Dodds	3	1/12/1881	15/8/1884
William Moore	2	30/10/1879	,,
J. S. Dodds	4	,,	1/12/1881
succeeded by			
W. R. Giblin	4	1/12/1881	15/8/1884
C. O'Reilly	10	30/10/1879	1/12/1882
succeeded by			
N. J. Brown	10	1/12/1882	15/8/1884
James W. Agnew ...	16	30/10/1879	5/2/1881
Thomas C. Smart... ...	16	1/12/1882	15/8/1884

XVI.—DOUGLAS MINISTRY, MERGED INTO AGNEW MINISTRY.

Name.	Office.	From—	To—
Adye Douglas	1	15/8/1884	8/3/1886
succeeded by			
James W. Agnew ...	1	8/3/1886	29/3/1887
Adye Douglas	2	15/8/1884	8/3/1886
succeeded by			
James W. Agnew ...	2	8/3/1886	1/3/1887
succeeded by			
H. I. J. R. Rooke ...	2	1/3/1887	29/3/1887
W. H. Burgess	3	15/8/1884	,,
John S. Dodds	4	,,	15/2/1887
succeeded by			
R. J. Lucas	4	25/2/1887	29/3/1887
N. J. Brown	10	15/8/1884	,,

XVII.—FYSH MINISTRY.

Philip O. Fysh	1-2	30/3/1887	17/8/1892
E. N. C. Braddon ...	10	,,	29/10/1888
succeeded by			
A. T. Pillinger	10	29/10/1888	17/8/1892
A. I. Clark	4	30/3/1887	,,
Bolton S. Bird	3	,,	,,
G. P. Fitzgerald ...	17	29/10/1888	23/5/1891

XVIII.—DOBSON MINISTRY.

Henry Dobson	1	17/8/1892	14/4/1894
Adye Douglas	2	,,	,,
William Hartnoll ...	10	,,	,,
Neil E. Lewis	4	,,	,,
John Henry	3	,,	,,
Charles H. Grant ...	17	,,	,,

XIX.—BRADDON MINISTRY.

Sir E. N. C. Braddon ...	1	14/4/1894	12/10/1899
William Moore	2	,,	,,
Sir P. O. Fysh	3	,,	30/12/1898
succeeded by			
Sir E. N. C. Braddon ...	3	1/1/1899	12/10/1899
Andrew I. Clark ...	4	14/4/1894	23/10/1897
succeeded by			
D. C. Urquhart	4	10/11/1897	12/10/1899
A. T. Pillinger	10	14/4/1894	6/5/1899
succeeded by			
E. T. Miles	10	10/5/1899	1/10/1899
Thomas Reibey	17	14/4/1894	12/10/1899

XX.—LEWIS MINISTRY.

Neil E. Lewis	1-4	12/10/1899	8/4/1903
Bolton S. Bird	3	,,	,,
G. T. Collins, M.L.C. ...	2	,,	,,
Edward Mulcahy ...	10	,,	,,

XXI.—PROPSTING MINISTRY.

W. B. Propsting ...	1-3	9/4/1903	11/7/1904
John McCall	2	,,	,,
Herbert Nicholls ...	4	,,	,,
Carmichael Lyne ...	10	,,	,,
Arthur Morrisby... ...	17	31/7/1903	,,

XXII.—EVANS MINISTRY.

John W. Evans	1	12/7/1904	19/6/1909
John W. Evans	14	,,	1/5/1906
succeeded by			
W. B. Propsting ...	14	1/5/1906	19/6/1909
Charles L. Stewart ...	3	12/7/1904	9/10/1905
succeeded by			
John W. Evans	3	9/10/1905	1/5/1906
succeeded by			
D. C. Urquhart	3	1/5/1906	19/6/1909
W. Moore, M.L.C. ...	2	12/7/1904	1/5/1906
succeeded by			
John W. Evans	2	1/5/1906	19/6/1909
G. C. Gilmore	4	12/7/1904	1/5/1906
succeeded by			
W. B. Propsting ...	4	1/5/1906	19/6/1909
Charles L. Stewart ...	11	12/7/1904	9/10/1905
succeeded by			
Alexander Hean ...	11	9/10/1905	26/11/1906
succeeded by			
D. C. Urquhart	11	26/11/1906	19/6/1909
Alexander Hean ...	10	12/7/1904	,,
W. Moore, M.L.C. ...	17	1/5/1906	,,

XXIII.—LEWIS MINISTRY.

Sir N. E. Lewis	1-3	19/6/1909	20/10/1909
G. H. Butler, M.L.C. ...	2	,,	,,
A. E. Solomon	4-14	,,	,,
Alexander Hean ...	10	,,	,,
John Hope, M.L.C. ...	17	24/6/1909	,,
C. Russen, M.L.C. ...	17	,,	,,

XXIV.—EARLE MINISTRY.

Name.	Office.	From—	To—
John Earle	1-4-14	20/10/1909	27/10/1909
Jens A. Jensen	2-7	,,	,,
James E. Ogden ...	3	,,	,,
James J. Long	10	,,	,,
J. W. Cheek, M.L.C ...	17	,,	,,

XXV.—LEWIS MINISTRY.

Sir N. E. Lewis	1-3	27/10/1909	14/6/1912
G. H. Butler, M.L.C. ...	2	,,	,,
A. E. Solomon	4-11-14	,,	,,
Alexander Hean ...	10	,,	,,
C. Russen, M.L.C. ...	17	,,	,,

XXVI.—SOLOMON MINISTRY.

A. E. Solomon	1-4-14	14/6/1912	6/4/1914
G. H. Butler, M.L.C. ...	2	,,	,,
H. J. M. Payne	3-7-12	,,	,,
Edward Mulcahy ...	6-10-11-15	,,	,,
C. Russen, M.L.C. ...	17	,,	,,

XXVII.—EARLE MINISTRY.

John Earle	1-4	6/4/1914	15/4/1916
James E. Ogden ...	2-11	,,	,,
Joseph A. Lyons ...	3-7-14	,,	,,
James Belton	10-12	,,	,,
P. McCrackan, M.L.C. ...	17	21/4/1914	,,

XXVIII.—LEE MINISTRY.

Sir W. H. Lee	1	15/4/1916	12/8/1922
Sir W. H. Lee	2	,,	31/3/1922
succeeded by			
Sir N. E. Lewis	2	1/4/1922	28/6/1922
succeeded by			
R. E. Snowden	2	28/6/1922	12/8/1922
Sir N. E. Lewis	3	15/4/1916	31/3/1922
succeeded by			
Sir W. H. Lee	3	1/4/1922	12/8/1922
John B. Hayes	8	15/4/1916	4/8/1919
succeeded by			
Alexander Hean ...	8	4/8/1919	12/8/1922
John B. Hayes	9	15/4/1916	,,
W. B. Propsting, M.L.C.	4	,,	,,
Herbert Hays	17	,,	28/6/1922
Tasman Shields, M.L.C.	17	,,	12/8/1922
James C. Newton ...	17	28/6/1922	12/8/1922

XXIX.—HAYES MINISTRY.

John B. Hayes	1-9-12	12/8/1922	14/8/1923
W. B. Propsting, M.L.C.	4	,,	,,
Sir W. H. Lee	3-14	,,	,,
James C. McPhee ...	2-7	,,	14/6/1923
E. F. B. Blyth	8-11	,,	14/8/1923
Alexander Hean ...	17	,,	,,
Tasman Shields, M.L.C.	17	,,	14/6/1923

XXX.—LEE MINISTRY.

Sir W. H. Lee	1-3-7	14/8/1923	25/10/1923
Alexander Hean ...	4-14	,,	,,
James C. Newton ...	11-13	,,	,,
Edward Hobbs	8-9-12	,,	,,
George H Pitt, M.L.C. ...	17	,,	,,

XXXI.—LYONS MINISTRY.

Joseph A. Lyons ...	1-3	25/10/1923	
A. G. Ogilvie	4-14	,,	
John A. Guy	2	,,	
Joseph A. Lyons ...	7	,,	26/3/1924
succeeded by			
John A. Guy	7	26/3/1924	
John A. Guy	11	25/10/1923	26/3/1924
succeeded by			
A. G. Ogilvie	11	26/3/1924	10/7/1925
succeeded by			
Joseph A. Lyons ...	11	10/7/1925	
A. G. Ogilvie	13	26/3/1924	
James Belton	8-9-12	25/10/1923	
A. Lawson, M.L.C. ...	17	,,	
G. G. Becker	17	10/7/1925	

Minnow. See JOLLYTAILS.

Mint-bush. See PROSTANTHERA.

Mints. See CURRENCY.

Mirbelia, a genus of the family Leguminosae, consisting of shrubs with yellow, purple, red, or blue flowers, endemic in Australia. The pod is oval or oblong, divided longitudinally into 2 cells by a wall projecting into the cavity

M. dilatata.

from the lower side. *M. dilatata,* a western species, has showy clusters of blue flowers, and triangular leaves which have given it the name of 'wedge-leaved' mirbelia. A coloured drawing of this plant, made from plants grown in 1823 at Kew Gardens near London, is given in Edwards' *Botanical Register. M. grandiflora,* a spreading shrub, bears a profusion of large yellow flowers.

Missions. This article is concerned with the missionary activities of the Christian communions in Australia—except the Roman Catholic, which are dealt with in the article on that Church.

Church Missionary Society.—Earliest in the Australian field was the Church of England. As far back as 1825 an auxiliary of the Church Missionary Society for Africa and the East, the headquarters of which were in London, was established in Sydney; it had for its objects the evangelization of the aborigines and the collection of funds for the parent society's operations in other parts of the world. Governor Brisbane became its patron, and Samuel Marsden its president. Marsden had in 1814 established the Church Missionary Society in New Zealand, and it was he who initiated the auxiliary in Sydney. Missionaries to the aborigines were sent from England, but the auxiliary was responsible for their maintenance. In 1832 J. C. Handt and W. Watson began work in the Wellington valley in New South Wales, and were joined in 1837 by James Günther; a station was also founded at Blacktown near Parramatta. But the nomadic habits of the aborigines, the hostility between them and the settlers, and friction with the colonial government, enforced a temporary abandonment of the work.

In 1892, at the instance of the auxiliary, Eugene Stock of the C.M.S. London and Robert Warren Stewart of the Fukien mission in China visited New South Wales; as a result the auxiliary was merged in an association, still linked with the parent society but empowered to select, train, and maintain Australian missionaries in any fields occupied by the parent society, and to undertake independent missions if it so desired. Similar associations were founded in Victoria, Tasmania, and South Australia, and in 1916 all four were federated as 'The Church Missionary Society of Australia and Tasmania.' Hussey Burgh Macartney (q.v.) in Victoria had for upwards of 30 years maintained a number of missionaries in India and China; after 1892 this work was, at his request, taken over by the Church Missionary Association of Victoria.' Since 1892 130 missionaries—including married clergy, medical men, and educational and industrial missionaries—have been sent to Church Missionary Society stations in India, Africa, China, Japan, Palestine, Persia, and Turkey in Asia.

In 1906 work among the aborigines was resumed at the Roper River in the Northern Territory, and other stations have since been established on Groot Eylandt and (at the instigation of the Commonwealth government) at Oenpelli near Darwin. In 1925 over 100 missionaries were at work, and the expenditure was over £35,000 annually. For many years the society has also carried on work among Chinese immigrants in New South Wales; this work, however, has been much lessened, because many Chinese residents of long standing have returned to their own country and new immigrants are not now admitted into the Commonwealth from China.

Testimony has been borne by the parent society to the admirable work done by Australian missionaries. Maynard Pain and John Bateman in Old Cairo and H. D. Matthews in Foochow, China, have rendered skilful medical service. Amy Wilkinson, wife of George Wilkinson who was formerly in charge of the Church Missionary Society hospital in Foochow—and herself a great-granddaughter of Samuel Marsden—has carried out work among the blind in China. Archdeacon E. W. Doulton and Canon Burns served efficiently in the Tanganyika territory and Kenya Colony respectively. Nellie and Topsey Saunders of Melbourne and Annie Gordon of Queensland were devoted missionaries and lost their lives at the time of the massacre at Hwa Sang in Fukien. Archdeacon Barnett has done distinguished evangelistic and scholastic work in China. A. R. Blacket was a pioneer to Persia from Victoria.

In 1916 a determination of the general synod of the Church of England in Australia (referred to below) provided that the Church Missionary Society of Australia and Tasmania should be recognized as an agency under the Australian

board of missions, with power of unfettered action in any diocese of Australia.

Australian Board of Missions.—George Augustus Selwyn (q.v.), the first bishop of New Zealand, in 1850 founded the Australasian board of missions as the department of the local Churches specially concerned with missions to the aborigines of Australia and New Zealand, to aliens residing in those countries, and to the heathen of the South Pacific. The board also took over the Australasian work of the Society for the Propagation of the Gospel, including the Melanesian mission. When a general synod of Australia was created in 1872, the board was reconstituted as the Australian board of missions. Its greatest work has been the foundation and extension of the New Guinea mission, which was founded by order of the general synod when Papua became a dependency of Australia. The work of Albert Maclaren and Copland King in this mission is specially notable, though Maclaren soon died of malaria; Copland King, after long service—which included much valuable work on translations into the Papuan languages—died in Sydney on 5 October 1918. Another early worker was Samuel Tomlinson, one of the six men recorded in the history of missionary achievement as having translated the whole Bible into a foreign language.

In 1898 Montagu John Stone-Wigg, then sub-dean of Brisbane, was consecrated bishop of New Guinea, and his generosity and enthusiasm placed the mission's finances on a sound footing. Stone-Wigg retired in 1908, and was succeeded by Gerald Sharp in 1910; he in 1921 was translated to Brisbane, and was succeeded in New Guinea by Henry Newton in 1922. The mission area allotted to the Church of England comprises a strip of the north-east coast between Cape Ducie and the boundary of the Mandated Territory, with its hinterland as far back as the main range. The coastal districts are effectively served, and some of the hinterland has been touched. The staff in 1926 consisted of about 40 missionaries, three native priests, four native deacons, a few Melanesians, and a large body of Papuan teachers.

The Australian board of missions devotes much attention to the aborigines. Of its stations Yarrabah was the first (1892); others are situated on the Mitchell (1905), Roper, Forrest, and Lockhart rivers. The success of Yarrabah has induced governments, both State and Federal, to give more assistance to missionary work. The first mission at the Forrest River station failed, partly for lack of adequate support, partly because in an attack by natives its head, Harold Hale, was severely wounded and rendered incapable of further service. A second attempt in 1913 under E. R. Gribble was more successful; Gribble had already for 17 years been in charge of Yarrabah, which his father had managed before him. The Lockhart River station was established at the request of the Queensland government to prevent the ill-treatment of natives of Cape York Peninsula by low-class whites and Japanese; a white layman is in charge, assisted by a native priest from Torres Straits and three other aborigines. The chaplain at Yarrabah regularly visits the Palm Island settlement, Barambah, and Taroom. The board of missions also maintains a missionary at the Western Australian aboriginal settlement about 100 miles from Perth, and has lent to the Aborigines' Friends Association of South Australia two nurses who help in the religious work at Point Pearce and Point McLeay. Further, when the London Missionary Society was compelled to abandon missionary work in Torres Straits, and asked the bishop of Carpentaria to take charge of it, the board took responsibility for the finances; four missionaries are at work among a community of 2000 Christian natives, two of whom have been ordained priests and two deacons. The board shares responsibility for work in the diocese of Polynesia with the New Zealand Anglican board of missions, and supports two missionaries (a teacher and a nurse). Nor does it neglect the white residents of these territories; in Papua it has two chaplains (at Port Moresby and Samarai), and in the Mandated Territory one, with headquarters at Rabaul (see MANDATED TERRITORY and PAPUA).

Presbyterian Church of Australia.—In 1850 William Ridley (q.v.) migrated to New South Wales and in 1852-6 worked as a missionary among the aborigines of northern New South Wales. In 1862 J. G. Paton (q.v.), who since 1858 had been working on Tanna in the New Hebrides, roused the Presbyterians of New South Wales and Victoria to contribute £3000 towards the cost of a vessel (the *Dayspring*) for the New Hebrides mission; after a visit to Scotland he went back in 1866 to Aniwa, John Geddes in 1864 was stationed on Erromango, Daniel Macdonald (a Victorian) in 1872 on Efate, R. M. Fraser and J. B. Weir on Epi, and F. H. L. Paton (afterwards foreign mission secretary for Victoria) on Tanna. In the New Hebrides there are now 16,000 native Christians, of whom 300 are trained teachers; the teachers' training institute is on Santo. The Church in New South Wales is responsible for stations on Malu and western Santo, the Victorian Church for those at Vila, Malekula, and Epi (at Vila there is a hospital); this Church also, in conjunction with the John G. Paton Mission, supports missionaries at Erromango, Tanna, Lenakel, Paama, and Hog Harbour on Santo.

Since the Presbyterians of the various colonies federated, a board of missions has been formed to control mission work among the Australian aborigines; this work is chiefly carried on in Queensland, and since 1923 is supervised by the Church in that State. The Western Australian station at Port George IV, however, is still directly under the board, as the local Church is not strong enough to take it over. The Queensland stations are at Mapoon, Weipa, Aurukun, and Mornington Island. With regard to other missions the assembly of each State conducts its own operations and reports to the general assembly through the board of missions. Victoria, South Australia, and Tasmania have workers in the New Hebrides and Korea, and Queensland shares the Korean work. The principal and most extensive foreign work of the Victorian Church is in Korea. It has stations at Fusanchin, Masan, Chinju, Tong Yung, Kuchang and Pyeng Yang. At all these stations there are considerable numbers of married and single missionaries, several of whom are members of the medical profession. New South Wales, besides its New Hebridean stations, has workers in southern India with headquarters at Sholingarh. New South Wales and Victoria carry on work among the local Chinese residents through two ordained Chinese ministers, John Young Wai in Sydney and J. Long Wai in Melbourne.

Australian Inland Mission.—This mission,

which is a branch of the Presbyterian Church, was initiated in 1912. It is all-Australian in character, has adopted as its motto 'For Christ and the Continent,' and ministers to settlers of every creed, or of none. Its aim is to provide a nursing-home within 100 miles of every settlement in the vast interior, and it has established them at Alice Springs, Beltana, Birdsville, Hall's Creek, Lake Grace, Marble Bar, Marranboy, Oodnadatta, Port Hedland, and Victoria River Downs. Further, it has missionary centres in central Australia, and at Broome, Gascoyne, Katherine, and Pilbara, and in western Queensland—and, with other Christian bodies, maintains a missionary on the east-west railway, with headquarters at Tarcoola; it intends to establish motor-patrols, each manned by two ministers of the Gospel, and to use the aeroplane as the most effective way of dealing with cases of sickness. The mission's field of operation aggregates 2,000,000 square miles.

Methodist Missionary Society of Australasia.—In 1855 the Australasian Methodist Church took over from the parent society in England responsibility for missions established in Tonga (1822), Samoa (1834), Fiji (1835), and Rotuma (1839). Since taking over these stations the Australian Methodist Church has also entered the following fields—New Britain (1875), Papua (1891), Solomon Islands (1902), Fiji inland mission (1902), and United Province, India (1909), and is at work among the aborigines of the Northern Territory. In 1925 the missionary stations were carried on by 41 ordained European missionaries, 29 missionary sisters, 10 lay missionaries, 128 ordained native missionaries, 321 native catechists, 1005 native teachers, and 4184 local preachers. They had 43,586 church members and 160,588 attendants at public worship. Their income amounted to £88,096, exclusive of a considerable sum raised by the natives themselves. Tonga and Samoa are entirely self-supporting, paying for their European missionaries in addition to all other expenses. Native work in Fiji is self-supporting, but the European missionaries there are paid by the Australian Church.

Australian Board of Baptist Foreign Missions.—Before 1864 Baptists in Australia sent occasional contributions to the Baptist Missionary Society of Great Britain and Ireland. On 10 November 1864 the first Australian Baptist Missionary Society was constituted at Adelaide, mainly through the efforts of Silas Mead. The first contributions were sent for the support of workers and missionaries in India appointed by the British society, but in 1882 Ellie Arnold and Marie Gilbert went to India as the first Australian Baptist missionaries. The return of the former to Australia in 1884 (owing to ill-health) led to the formation of societies in all the States save Western Australia, which came in 15 years later; for a time Tasmania was affiliated to South Australia. Up to 1912 these societies initiated and managed their own work, but in August 1911 a convention of State unions held in Melbourne suggested a basis of federation, and on 5 February 1912 this was adopted at Adelaide and a board of missions was constituted representing five States (Queensland sent delegates six months later). The area served comprises the districts of Faridpur, Goalundo, Sirajganj, Mymensingh, Comilla, and Noakhali; these had previously been served by the societies of South Australia, Western Australia, Tasmania, Victoria, New South Wales, and Queensland respectively.

Kanaka Mission in Queensland.—During the seventies and eighties of last century large numbers of South Sea islanders were enticed to leave their homes for work in the Queensland cane-fields. At one time as many as 10,000 'kanakas' were working on the plantations, many of them near Bundaberg on the properties of Horace and Ernest Young. These brothers and their families organized classes in which their kanakas were taught Christianity, and the evangelistic movement quickly spread to other fields in the colony; soon the sugar-growing districts were covered by 11 mission-centres with 19 missionaries, there was a weekly average attendance of 7000 at the Bible-classes, and 2500 islanders were converted and baptized. More than 100 of these taught (unpaid) under the supervision of the missionaries, and for nine years the Christian kanakas supported a European missionary in China. Ultimately they were all repatriated (see IMMIGRATION RESTRICTION) and in 1906 the mission in Queensland came to an end; but several workers followed them to their island homes, and in 1907 the *South Sea Evangelical Mission* was established under the superintendence of Florence Young, assisted by councils of advice in Sydney, Melbourne, and the leading cities of New Zealand. Since the initiation of the mission five workers have died and 27 (four of them natives) have been retired for health or other reasons. In 1925 25 missionaries were at work, with Northcote Deck, who has been out since 1908, in charge. Four mission ships and two launches are employed.

Congregational Church.—The London Missionary Society was one of the earliest to start work in the South Pacific. Many of its missionaries were men of heroic type—John Williams, martyred at Erromango, James Chalmers, martyred in Papua, and W. G. Lawes. In 1883 the Australian auxiliaries were allowed to examine and recommend candidates without reference to London; in 1926 they have 12 men and 23 women in the field, among them A. W. Brough (Kaiser-I-Hind medal) and H. W. Whyte, who have rendered distinguished service in southern India. Howard Smith and Dr. E. J. Stuckey in China, and H. P. Schlencker and Harold Short in Papua are worthy successors of Macfarlane, Murray, Lawes, and Chalmers.

When in 1919 the Australian auxiliaries entered into more intimate relationship with the parent society, the control of the mission in Papua was handed over to an Australian committee, which also acts as an advisory board for the work in the South Pacific. The missionary ship *John Williams* is employed in maintaining communication between Sydney and the stations in the South Seas and Papua. Australian Congregational Churches contribute from £10,000 to £12,000 a year for the mission work now apportioned to them.

The *Australian Churches of Christ* began foreign mission work in 1889, and now have missions in India at Harda in the Central Provinces; at Baramati, Shrigonda, Diksal, Indapur, and Dhond in the Bombay Presidency; in China at Shanghai and at Hueilichow in Szechwan; and in the New Hebrides on Pentecost, Oba, and Maewo. They also have missions for Chinese at Sydney, Melbourne, Adelaide, and Perth. In 1925 they supported 28 missionaries, 200 native co-workers, 1250 day-scholars, and 175 orphans.

China Inland Mission.—The history of this mission is inseparable from the name of Hudson

Taylor, who founded it, organized its manifold ramifications, and remained its director for upwards of 50 years.

In the eighties seven leading athletes of the university of Cambridge resolved to devote their lives to missionary work in China—D. E. Hoste (now director of the China Inland Mission), Stanley P. Smith (formerly stroke of the Cambridge eight), W. W. Casells (subsequently bishop in Szechwan), C. T. Studd (who had played cricket for England against Australia), Montague Beauchamp (who had been a university oar), and C. P. and A. T. Polhill (the former an officer in the 2nd dragoon guards, and both of them prominent in cricket at Eton and Cambridge). The interest extended to Australia, and was accentuated by the fact that Hudson Taylor was appealing for an additional thousand missionaries for China. In 1890 the exertions of H. B. Macartney (already mentioned), C. H. Parsons, W. Lockhart Morton (a Presbyterian), and Alfred Bird (a Baptist) stimulated the formation of an Australian branch, which has since then sent to China 230 missionaries (92 men and 138 women). Parsons went to China, and an Australian council was formed to arrange for the reception and training of suitable candidates. The mission carries on its operations in the inland provinces, those on the coast being dealt with by other societies. In 1925 there were 116 Australian missionaries (43 men and 73 women) labouring in 14 provinces.

The *Sudan United Mission* was formed in London in 1902 to place a line of mission-stations from the Niger to the Nile in order to protect the pagan tribes from the Mohammedans, who press the acceptance of their tenets at the point of the sword. In 1911 Australia resolved to share in the work, and the first Australian missionaries settled at Melut on the Nile, 500 miles south of Khartoum, where they maintain an efficient hospital. At the request of the Anglo-Egyptian government five Australians have been sent to the Nuba Mountains province (150 miles from Melut) and two to Abri; elementary and industrial schools have been opened, school primers have been prepared, and some of the Gospels have been translated into the native language. C.R.W.

Seventh-day Adventists.—The Australasian Union conference of Seventh-day Adventists is carrying on missionary effort among the natives in 12 mission-areas of the Pacific islands. Their 136 missionaries are now at work in the following groups: Society Islands, Fiji, New Hebrides, Solomon Islands, Cook Islands, Samoa, Tonga, and in Papua, Niue, Lord Howe, and Norfolk islands. At Monamona, near Cairns in northern Queensland, and in the Kempsey district of New South Wales, there are aboriginal mission-stations, and the young natives connected with these have shown themselves bright and susceptible to educational influences.

145 Sabbath-schools have been organized in the islands, with a regular membership of 4460, and large numbers who attend irregularly. Daily instruction is given to 1276 pupils in 61 schools, in which are employed 65 teachers. Seventy-two church buildings have been erected in the various islands, and the enrolment of baptized adult church members now numbers 1430. Several Young People's Missionary Volunteer societies have been organized, the membership being 768. The total funds raised by the Australasian conference during the year 1925 for island missions amounted to £44,470.

The missionaries of the denomination receive their training at the Australasian Missionary College, Cooranbong, New South Wales, where in addition to their theological studies they are instructed in practical branches of industry, such as carpentry, painting, engineering, tinsmithing, farming, baking, domestic science, etc. Recognizing the dire need of medical missionaries in the islands, Seventh-day Adventists have provided a training-school for such missionaries at the Sydney Sanitarium, Wahroonga. A three-years course of theoretical and practical instruction is given by the three resident medical practitioners, assisted by qualified and experienced nurses. During their course, Bible instruction is imparted to the trainees by the chaplain of the institution. Although the expense is heavy, it is fully warranted by the excellent results achieved. A.W.A.

Mistletoe-bird, a small, arboreal, perching bird (*Dicaeum hirundinaceum*) the only representative in Australia of a genus found throughout southern Asia and the Malay Archipelago, and belonging to the family Dicaeidae (flower-peckers). The male mistletoe-bird is brilliant blue-black above, with a bright red breast and another red patch under the tail; the female is duller above, and the only red beneath is a pale patch beneath the tail. The species is common throughout most parts of Australia, but does not occur in Tasmania. Owing to their habit of keeping to tree-tops the birds are comparatively rarely seen, except by those familiar with their

Mistletoe-bird (*length* 3½ *in.*).

lively notes. They feed largely on the berries of mistletoes (*Loranthus*), supplemented by insects, and are probably of much assistance in spreading these plants from tree to tree. The nest is perhaps the most beautiful constructed by any Australian bird, being a deep bag composed of white downy hairs (derived from the seed-vessels of various plants) suspended from a branch. The eggs are dull-white. W.B.A.

Mistletoes. See LORANTHUS.

Mitchell, DAVID SCOTT (1836-1907), only son of James Mitchell (q.v.), was born on 19 March 1836 in the surgeon's quarters at Sydney hospital; at the age of 16 he was admitted to the university of Sydney as one of its first 24 matriculants and one of the first seven scholars on its foundation (B.A., 1855; M.A., 1859). He was called to the bar in 1858 but, sensitive and retiring in disposition—lazy, too, he later confessed—he never practised. For the politics of the day, newly leavened with democracy, he had all the scorn of a cultured aristocrat, and took no interest in his father's business affairs beyond giving him occasional legal advice. In his youth he played cricket and was a good dancer; but his health was always precarious and shaped (if it did not determine) the course of his life. His interest was in literature, especially Elizabethan, and he was familiar also with the eighteenth century writers and the poets of the early 19th century. He himself wrote occasional verse, of no literary merit but interesting in so far as it substantiates the story of his affection for Emily Manning (see HERON, E. M.) whose 'clarion words' summoned him 'to mingle in the crush of life;' but she refused to marry him, and his sensitive pride took refuge behind a reserve that was hardened by the publicity occasioned by legal proceedings in connection with his father's will. About 1871 his friends endeavoured to bring him into the service of the State by offering him the attorney-generalship; but he was set in his ways, and declined. He sold his property in Cumberland-street and moved to Darlinghurst, where, remote from old associations, he began to gather what is now the greatest collection of Australiana in the world. His means, when once the Mitchell estates were freed of mortgage, were ample, and Australiana from all parts of the world streamed towards him. As a result books, pamphlets, diaries, manuscripts, autograph letters, portraits, views and pictures, broadsides and proclamations, log-books, maps and charts, coins and tokens and medals—the original material which alone can yield the secrets of Australian history—were stored in the overcrowded rooms of his house, which he never left except to visit the booksellers. He never allowed a rare thing to escape him; on the other hand all Australiana, rare or commonplace, were fish for his net. 'I must have the damned thing' he would say, 'in order to show that it is worthless.'

Until the nineties Mitchell seems to have made no plans for the eventual disposal of his collection. His cousin, Rose Scott (q.v.), who was one of his few regular visitors, and his old friend Dr. James Norton realized its value to Australia; and, urged by them, on 17 October 1898 he communicated to the trustees of the public library (of which Norton was president) his intention to bequeath it to them, together with an endowment, provided they were constituted a corporate body. His distrust of politicians prevented his bequeathing it to the State. He stipulated, however, that the government should provide suitable accommodation for the public library, preserve his collection intact in a separate wing or set of rooms to be known as the Mitchell Library, and make it freely available to students on conditions similar to those obtaining at the British Museum. In the following year an act was passed making the trustees a corporate body with perpetual succession, able to hold and administer any property bequeathed to them; such bequests were also exempted from stamp and probate duty. Thereupon Mitchell handed over the 10,000 volumes that made up his general library, and 50 pictures, as an earnest of his purpose—and, incidentally, to make more room for Australiana in his house in Darlinghurst-road. But the government was slow to comply with his conditions, being unwilling, it seems, to incur large expenditure in housing a library about which so much had been heard but so little was known, and the reputed value of which was said to be exaggerated. On 14 February 1901 Mitchell made a will bequeathing his collection to the trustees, together with an endowment of £20,000; being naturally resentful of the government's inaction, he added a proviso to the effect that it must be taken over and properly provided for within a year of his decease, the executors being empowered to grant an extension of time under certain conditions. The trustees and the public librarian, aware of his failing health, induced the government to reserve a site for a new public library—at first (in 1904) in the outer domain between the art gallery and St. Mary's cathedral, but in the following year in the present position, facing Macquarie-street and adjoining parliament-house. The erection of a library building was referred to the public works standing committee on 10 October 1905, before which the value of Mitchell's Australiana was proved by incontestable evidence; the necessary act was passed, plans were prepared by the state architect, W. L. Vernon, and on 11 September 1906 the foundation-stone of the Mitchell wing was laid by J. H. Carruthers, then premier, but for whose vigorous action the library might have been lost to the State. Mitchell refused an invitation to perform the ceremony, or even to be present. Satisfied that his conditions would be fulfilled and pleased to have perpetuated the family name, he increased the endowment to £70,000. The building was still under construction when he died on 24 July 1907; but from the window of the room in which he lay dying he could see its walls steadily rising.

When Mitchell died, 61,000 volumes, manuscripts, maps, views, portraits, etc., were taken over by the library trustees, packed and put into bank vaults until the building was ready to receive them; they were then gradually removed to it and the work of cataloguing was begun. In October 1909 Hugh Wright of the public library staff, was appointed Mitchell librarian under the control of the principal librarian. The official opening was on 8 March 1910. Since that time the collection has been greatly enriched by the judicious purchases made by the trustees.

Mitchell, JAMES (1792-1869), born in Fifeshire, Scotland, in 1792, entered the army medical department at the age of 18 (L.R.C.S., Edin., 1813), and had nine years' active service in Spain, America, the Netherlands, and the West Indies. On 22 June 1820 he was appointed assistant surgeon in the 48th regiment, then stationed in Sydney, and arrived in the colony by the *John Barry* on 7 November 1821. When the regiment was reduced in strength in 1822, he went on half-pay, and on 11 June 1823 was appointed to the colonial medical service and attached to Sydney hospital (then part of the convict establishment), of which he was given charge in 1825. In 1829 John Bowman, the principal surgeon, was appointed inspector of hospitals, and Mitchell was promoted surgeon. He built up an extensive private practice, and in 1833 resigned from the army—'I much regret the loss of your service to the Department'

wrote the director-general of the army medical department on 25 September.

Mitchell had many interests outside his medical work. In 1827 Allan Cunningham gave his name to a river (now the Namoi) 'as a compliment to the medical officer to whom I am so much indebted for the very valuable details of barometrical observations taken in Sydney during my absence on the journey.' As was customary, a grant of 2000 acres—which he selected at Burragorang—was made in his favour when he joined the colonial service, and during the thirties he also acquired, by grant and purchase, large landed interests chiefly in the Hunter River district, where his brothers-in-law, Robert and Helenus Scott, were landed proprietors. In 1836 he helped to form the Australian Gas Light Company of Sydney.

In 1836 the colonial medical service was reorganized and put under military regulations; this change was resented by the colonial surgeons, and the new chief, John Vaughan Thompson, did nothing to allay the hostility. From the outset he and Mitchell were at loggerheads, chiefly on questions of organization; in March 1837 Mitchell was temporarily suspended from office, and Bourke reprimanded him for insubordination. In September, when called upon to attend a flogging at the Hyde Park barracks—an unpleasant duty which for many years had devolved upon the assistant surgeon—Mitchell refused to obey, and was dismissed the service. His cause was supported by part of the local press and by influential friends, and he was allowed to produce evidence in his defence. Bourke, however, stood by his previous decision, and was supported on appeal by the colonial office—which at a later date, however, ordered Gipps to allow Mitchell to submit further evidence; Gipps 'in the interests of H.M. service' decided against a permanent reinstatement, but suggested that he might be reinstated for a day and allowed to resign. This was agreed to by the colonial office on 1 October 1841. Mitchell's defence is contained in a pamphlet, *Statement of the case of Jas. Mitchell Esq.* (1838). See HOSPITALS.

On retiring from the service, Mitchell pursued his medical work less vigorously, and after a while ceased to practise, but maintained his connection with the profession through the New South Wales medical board, of which he became a member in 1845 and president in 1852. In this capacity he was in 1853 appointed one of the official trustees of the Australian Museum; in 1855 he was nominated to the legislative council, and in 1856 and again in 1861 to the new council under responsible government. Business interests absorbed his energy to an increasing extent. He suffered financially from the failure in 1843-4 of the Bank of Australia (of which he was a director) losing all his properties except certain Hunter River land which was at the time considered valueless. When, however, the Australian Agricultural Company's coal monopoly ceased, he developed plans for working his coal-bearing land at Burwood (near Newcastle) and proposed to combine the smelting of copper and other ore with coal production. In May 1849 he was allowed to occupy for wharfage purposes vacant crown lands on the waterside at Newcastle, and in 1850 to construct a light line from his mine to the wharf through the Australian Agricultural Company's estate; in 1853 he organized the Newcastle Coal and Copper Company, gave it a long lease of his mines and other works at Burwood, and transferred to it all his acquired rights. About the same time he became one of the original proprietors of the Hunter River Railway Company, formed to construct a railroad from Newcastle to Maitland; the property of this company and of the Sydney Railway Company was taken over by the government in 1855. Mitchell also established an extensive woollen-factory at Stockton near Newcastle, but the venture was not a success.

In the early sixties the Newcastle Coal and Copper Company failed, and Mitchell had his Burwood property back on his hands. He proposed at first to establish a glass and porcelain factory, and was supported in this by W. E. Wolfskehl—a recent arrival in the colony—who represented himself to be a member of a banking family at Darmstadt in Germany. This project falling through, the two collaborated in establishing the Burwood and Newcastle Smelting Company, Mitchell having meanwhile become surety for Wolfskehl to the Bank of New South Wales for £15,000, which he was afterwards called upon to meet. It was proposed to obtain ore from the Currawang mine (near Goulburn) in which both acquired an interest. But after the Burwood works had been in operation for nine months (from September 1866 to May 1867) the Currawang mine proved a failure, and the works, unable to obtain supplies of ore, were temporarily closed. In November 1868 the Burwood engineer was sent to South Australia to procure supplies of ore and to establish a coal agency. Just then Mitchell's health suddenly failed, and he could no longer perform his many duties—he was president of a medical board, a legislative councillor, trustee of the museum, fellow of St. Paul's College, chairman of the Australian Gas Light Company, director of the Australian Mutual Provident Society, and the proprietor of estates (mortgaged in part to meet recent obligations) valued at £100,000. He died on 1 February 1869.

After his death it was found that he had, a month previously, made a will by which the management of his estates was left in the hands of Wolfskehl as sole executor, who was further authorized to mortgage them (to their full value, if necessary) to carry on the business enterprises which had already been undertaken. Mitchell's family produced a will made in 1841, and disputed the new will on the grounds of mental incapacity and undue influence. The resulting lawsuit, in which the attorney-general appeared for Wolfskehl, aroused great public interest, heightened by the court's order forbidding publication of the proceedings—an order which was rescinded shortly before the close of the trial. Judgment was in favour of the Mitchell family—an important decision, in view of the fact that it was from part of the proceeds of the estates in question that David Scott Mitchell (q.v.) purchased and endowed the Mitchell Library.

On 6 June 1860 Mitchell indicated by petition to the Lyon King of Arms in Scotland that, out of respect to his wife's family, he had assumed the surname of 'Scott' in addition to and before that of his own, and was now known by the name of James Scott-Mitchell; he desired a licence to bear and use such arms as might be indicative of his name, marriage, and station in life. The licence was granted on 6 October 1860, but he does not seem to have adopted the new surname for general use.

Mitchell, JAMES (1834-1914), the best known of a family of pioneer squatters remarkable alike for its ancestry and for its achievements in the pastoral development of the upper Murray valley.

The founder of the family in Australia was WILLIAM MITCHELL (1786-1837), an officer of the Kent militia who retired with the rank of captain and about 1811 migrated to New South Wales. In 1815 Macquarie granted him 200 acres at Upper Minto, of which he was probably already in occupation. Here he was neighbour to a French *emigré*, Gabriel Louis Marie Huon de Kerilleau—Kerillac and Kerrillian are variants of the name, and in 1822 its owner signed himself Killian. Gabriel had left France for personal, not political, reasons in 1789, joined Nepean's company of the New South Wales Corps under the name of Thomas Lewis, and reached Sydney in June 1790 (a less probable story makes him leave France in 1792 and enlist under the name of Louis Michel); by 1800 he had reverted to his own name, and in 1807 was discharged from the Corps by order of the colonial office, which had just discovered that he was related to a French bishop. In 1807-9 he was teaching French at Parramatta, and acted as tutor to John Macarthur's family; Bligh gave him land at Bankstown, and Paterson at Minto.

William Mitchell married Gabriel's daughter Elizabeth (named after Mrs. Macarthur), and the families lived on intimate terms both at Minto and (from 1825 onwards) in the Goulburn district near Bungonia, where Brisbane granted them land; Mitchell's estate was known as Brisbane Meadows and his friend's as Corrundaroo or Corrundunna. In 1837 William Mitchell was lost in the bush between Bungonia and the coast. In 1836 two of Gabriel's sons, Paul and Charles—who as far back as 1822 had dropped the territorial part of their name and were known as 'Huon'—took up on the Murray River a run which they named 'Wodonga;' in 1837 Charles took up Mungabareena run (on which the town of Albury now stands), and on William Mitchell's death handed it over to his sister, Mitchell's widow. This brought her four sons one after the other to the Murray district. Thomas Mitchell, the eldest, managed his mother's new station for 14 years, adding to it two more between the Kiewa River and Yackandandah; in 1852 he bought Tangambalanga on the Kiewa, sold it in 1874, and in 1875 settled down at Bringembrong near Welaregang on the upper Murray. Edward Mitchell, the second son, was for a long time left in charge at Brisbane Meadows, but in the end settled at Ellerslie near Albury. John Francis Huon Mitchell, the third, managed Mungabareena for his mother after Thomas left it, in later life moved to Ravensworth in Victoria, and in 1904 published a *Vocabulary of the Woradgery Language*. He died in 1923 at the age of 92.

James Mitchell, the fourth son, born at Brisbane Meadows in 1834, was educated at The King's School at Parramatta, and trained for a pastoral life by his brother Thomas at Mungabareena. In 1859 he took over Table Top (just north of Mungabareena) from his mother, who had bought it in 1851. This station had for many years been considered unlucky, being heavily timbered and lacking permanent water; James deepened the watercourses, stored water in huge 'tanks,' enlarged the estate from 3000 to nearly 50,000 acres, and established on it famous flocks of sheep and herds of cattle. Table Top wool in many years topped the Sydney market; the Table Top herd of Devons was in its time the largest in Australia. When rabbits became a pest, James wire-netted all his paddocks, and at the cost of £30,000 exterminated them from his run. He was also a renowned horse-breeder; but in this respect Thomas's family excelled him, Trafalgar and Patrobas (see RACING) having been bred at Bringembrong. From politics James, like the rest of his family, held himself strictly aloof, though he entertained at Table Top most of the leading Australians of his time, including the politicians. He died on 5 April 1914.

Thomas Mitchell of Bringembrong—he owned several other stations on the upper Murray—was a great trafficker in land; more than a dozen stations at one time or another passed through his hands. His younger son Peter Mitchell (the breeder of Patrobas), who died in 1924, bequeathed about £250,000 'to encourage and help the capable, healthy and strong to develop and bring to fruition their natural advantages.' Unmarried women under 30, youths under 21, the New South Wales police force, and the naval and military forces of the Commonwealth and the Empire, were designated as the special classes to be favoured. All candidates for prizes under the scheme are judged primarily by their physical and mental soundness, self-reliance, and initiative; for women, knowledge of the history and literature of the Commonwealth and the Empire is an additional qualification; for youths, success in sports and capacity for leadership. When the scheme of prizes is finalized, competitions will be held annually.

Mitchell, SIR THOMAS LIVINGSTONE (1792-1855), eldest son of John Mitchell of the Carron iron-works, was born at Craigend in Stirlingshire, Scotland, on 16 June 1792 and in 1808, after a little schooling, joined the army in the Peninsula as a volunteer, with the Duke of Wellington as his patron. He saw service at Ciudad Rodrigo, Badajoz, Salamanca, Vitoria, the Pyrenees, and San Sebastian, and on 14 June 1811 was commissioned ensign in the 95th Rifles (lieutenant, 1811; captain, 1822; major, 1826). As a volunteer the greater part of his time was spent in map-making and sketching, and so impressed was the war office by his work that in 1814 he was commissioned to prepare plans of the battle-fields and the positions of the contending armies. For a long time his models and plans were used at Sandhurst; they are now in the quartermaster's department and the United Service Institution. His work in this branch of military engineering secured him in 1827 an appointment in New South Wales. On 13 January 1827 (to quote from his diary) he was offered '3 difft. situations at New South Wales worth £500 a year each—a Collector, Civil Engineer and a second, or assistt., to Mr. Oxley, with the reversion of his appt.' He chose the last, reached the colony on 23 September, and immediately began his duties as deputy surveyor-general, occupying his time principally with map-making, road-surveying, and the collation of the numerous detached surveys to form a general map of the colony.

Oxley died on 25 May 1828 and Mitchell became surveyor-general; as such he not only accomplished the survey of eastern Australia and the division of its settled area into counties, but laid out towns, roads, and public reserves, and made personal surveys of the main southern (1829) and western (1830) roads with a view to their improvement. The main southern

road was then little more than a track made by the pioneers and the western road was still 'that wonderful, though somewhat primitive, highway which Captain William Cox had so expeditiously constructed to the order of Governor Macquarie in 1814.'

The explorations of 1831, 1835, 1836, and 1845, by which he is best known, are described under EXPLORATION BY LAND; they added vast territories to the colony, and resulted in the acquisition of a mass of extremely useful information concerning the geology, meteorology, and plant-distribution of the inland areas. These journeys were, however, merely episodes in the exacting and constantly increasing work of the surveyor-generalship. In 1829 the survey, construction, and maintenance of roads and bridges throughout the colony were put under Mitchell's control, and the steady expansion of settlement due to assisted immigration made it imperative to devote great attention to internal communications. When after 1836 Mitchell began to busy himself also with preparing for publication the journals of his expeditions, he found the strain almost too great. In 1838 he obtained leave of absence and went to England to see *Three Expeditions into the Interior of Eastern Australia* through the press. Queen Victoria knighted him, Oxford made him a D.C.L., and the war office, remembering the value of his survey-work in the Peninsula, belatedly promoted him lieutenant-colonel. Returning to New South Wales he wiped off arrears of office work and then by way of a hobby contested the election of representatives for Port Phillip in the new legislative council. In 1843 he was defeated, but in April 1844 was elected; in August, however, having discovered that as an official he was expected to support government measures unreservedly (though he had been elected as an independent member), he resigned, and turned his attention to preparing for the explorations of 1845. In that year he published in London the *Journal of an Expedition into the Interior of Tropical Australia*. In 1851 he was commissioned to report on the western goldfields of New South Wales. In 1853 he revisited England, taking with him a propeller for steamships which he had devised on the principle of the boomerang—this he patented in England and America, and it was tested successfully on the Queen's yacht and on H.M.S. *Conflict*. The Pioneers' Club, Sydney, has a model of this propeller. The last few years of his life were clouded with worry; bronchitis (brought on by exposure when laying out the Clyde bridge at Braidwood) set in, and he died at Darling Point, Sydney, on 9 October 1855. (Kt. Bach., 1838.)

The variety of Mitchell's literary work is startling. He began with two drill-books, a *Manual* and *Platoon Exercises*; in 1827 he published *Outlines of a System of Surveying for Geographical and Military Purposes*. Next came the two *Journals* already mentioned. In 1849 he issued *Notes on the Cultivation of the Vine and Olive*, in 1851 an *Australian Geography*, and in 1854 *The Lusiad of Luis de Camoens, closely translated*. In 1856 appeared a posthumous *Report upon the Progress made in Roads and Public Works in New South Wales*, dealing with the period 1827-55. His interest in art was shown when in 1842-3 Surveyor Davidson reported to him the discovery of 'masses of the most beautiful white marble' in the valley of the Abercrombie west of the main range. Mitchell at once asked for blocks of it for sculpture, and in August 1843 employed Charles Abrahams to model a bust to be cut out of one block—the first genuinely Australian sculpture. This (the subject is not known) was placed on a pedestal of the same marble 15 inches by 16 by 12, and for some years adorned Mitchell's house at Potts' Point; its fate is uncertain, but the evidence goes to show that it was broken up by some vandals for road-mending.

Mitchell's character was full of incompatibilities. He was a mathematician with high artistic attainments, a stern soldier with 'an excessive tenderness' for his fellow-beings and a strong sense of humour. He belittled the work of Sturt, but could praise the faithfulness, courage, and endurance of the convicts who served on his expeditions.

Mitchell, SIR WILLIAM HENRY FANCOURT (1811-1884), born at Leicester in England in 1811, migrated to Tasmania while still a youth and in April 1833 obtained employment in the colonial secretary's office in Hobart, rising to be assistant colonial secretary in 1839. The attraction of the newly opened Port Phillip district then drew him to the mainland, where he took up squatting in the Kyneton district. When the Victorian police force was disorganized by the turmoil of the first gold-rushes, Latrobe made Mitchell its chief commissioner, and his stern discipline, coupled with his far-sighted action in enlisting young enthusiasts as police cadets on probation, both re-established confidence in the force and practically suppressed a very dangerous outbreak of bushranging. After a visit to England in 1855 he was elected to the new legislative council of 1856 as a member for the north-western province of Victoria, and represented the first Haines ministry in the council until March 1857, though he held no departmental office; in the second Haines ministry (1857-8) he was postmaster-general, and devoted to the post-office the same talent that had remade the police force four years earlier. As a result he was in 1858 defeated at the polls, but was re-elected in 1860, and in December 1861 joined Haines in taking office under their former opponent John O'Shanassy. When this ministry left office in June 1863, Mitchell abandoned active party politics and busied himself with maintaining and strengthening the position of the legislative council. During the bitter attacks made on that body for its rejection of the tariff (1865) and the Darling grant (1867) because they had been 'tacked' to appropriation bills—see DARLING, SIR C. H., and MCCULLOCH, SIR JAMES—he stoutly maintained the council's rights, and in 1868 circumspectly aided the passage of a bill that re-established its influence by nearly doubling its electorate. His rewards were the chairmanship of committees in March 1869 and the presidency in October 1870. This office he held until his death on 24 November 1884. Apart from his political and squatting activities he was chiefly conspicuous as the mainstay of Goldsbrough and Company, one of the most important of Australian wool-selling firms. (Kt.Bach., 1875.)

Mites. See ACARINA.

Mocking-birds. Although this term is generally used to denote birds of the American genus *Mimus*, it may reasonably be extended to include many Australian birds which also practise voice-mimicry—a subject which has not been closely studied in Australia or elsewhere. Many problems still await solution—Why do birds use vocal mimicry? Does it serve any useful purpose? Has food or habitat anything to do with

the practice? Is it confined to particular orders or groups? Is mimicry taught by the parent-birds?

Australia's mocking-birds range from the lyre-bird, which is almost as large as a turkey in body, to the mistletoe-bird, which measures scarcely four inches over all. The lyre-bird is generally regarded as the finest mocker in the world; its voice is remarkably rich and flexible, and can render almost any sound from the puffing of a motor-omnibus to the squealing of young foxes. In semi-confinement the lyre-bird has been proved capable of voicing words; one attached to a farm in Victoria imitated to perfection a child crying, a dog howling, kookaburras 'laughing,' and drays moving, and also learned to say 'Gee up, Bess' and other words used by teamsters. The belief that mockery was confined to the male lyre-bird has been dissipated. The female also is an imitative vocalist. One in particular was heard and seen while she carolled like a magpie, laughed like a kookaburra, barked like a fox-terrier, yelped like a fox, and cackled like a hen. Sounds which the lyre-bird alone mimics, and which even it appears to find some difficulty in mastering, are the extraordinary 'laughter' of the kookaburra and the queer wail of the cat-bird.

This cat-like cry is one of the chief calls of another splendid mimic, the spotted bower-bird (see BOWER-BIRDS). It uses this call so freely and in such remote places that it may be a natural one—an original note which has been more firmly retained by its relative the cat-bird. Mockery of the cat-bird it is not—for, whereas the spotted bower-bird is a dweller in the great interior, the cat-bird is confined to the coast. In its general mimicry the spotted bower-bird shows a predilection for harsh sounds. Its voice lacks the flexibility of the lyre-bird's; the cries of hawks, butcher-birds, and frogs, and the creaking of branches it imitates to perfection, and it has even been known to imitate the twanging made by sheep when clambering through wire-fences, and the pattering of rabbits in a warren. The satin bower-bird, which frequents the scrub and jungle of the eastern coast, is also a mocker of marked ability, but is less consistent than some of its relatives. It has been known to mock the grunting of the koala (native bear) as well as the notes of other birds. Mockery is also practised by other species of bower-birds—except, apparently, the regent-bird, which appears to be a degenerate bower-bird.

The Tooth-billed Cat-bird (*Scenopoeëtes dentirostris*) of northern Queensland, long regarded as a bower-bird, is certainly allied to that genus in its fondness for mimicry and play, but in other respects approaches the cat-birds proper (*Ailuroedus*). The most startling imitations yet attributed to a toothbill were those of the whirring rattle of a just-caught cicada, and the distressed cry of a captive frog.

Other mockers are the scrub-bird (*Atrichornis*), yellow-throated and white-browed scrub-wrens, chestnut ground-wren, red-throat, silver-eye, oriole, drongo, bush-lark, gray butcher-bird, one or two thornbills (tits), one or two wood-swallows and the introduced starling. Most mockers spend most, or much, of their time on the ground, and so are more sensitive to sounds than those which maintain guard by means of vision; they have, too, more surplus energy than birds which are freely on the wing. These two considerations seem to touch the entire problem as to why birds mimic. They do but mock because they must—because of their high vitality, their sensitiveness to, and appreciation of, compelling sounds: in brief, because of their *joie de vivre*. As leisure or scope for mimicry increases, so does a bird's power of picking up sounds—always provided, of course, that physical ability is innate. This point may be appreciated by considering cockatoos, parrots, and certain other cage-birds, which in a state of nature are not imitative but readily acquire new vocabularies when given the leisure afforded by captivity. Dr. Walter Garstang has laid it down that birds are sound-lovers, who 'cultivate the pursuit of sound-combinations as an art, as truly as we have cultivated our arts of a similar aesthetic character.' This applies with special force to mocking-birds. It would appear, however, that limitations are largely fortuitous and purposeless. Many inland residents believe that the spotted bower-bird frequently uses mockery to draw intruders away from its nest; it is more probable that the bird is merely expressing anxiety in the only possible manner, borrowed notes having become part of its vocabulary—perhaps almost its entire vocabulary of major sounds. The emotions of courtship may stimulate mockery, but in many cases it is used by both sexes, and is frequently heard outside the breeding-season; the fact that it is more noticeable in the spring is merely an indication of the bird's increased vitality at that time.

The question whether imitative notes are inherited is a difficult one to answer. It is possible, but not probable, that the young of master-mockers, besides inheriting the ability to mimic, are gifted with actual borrowed notes—that is, such notes have become part of the vocabulary of the parents, and are, or may be, the baby's birthright. A lyre-bird has been known to imitate a circular saw some 30 years after the timber-mill in its area had been dismantled. Other lyre-birds have been known to reproduce the calls of birds which left their district about 15 years previously. It does not follow, however, that they inherited the notes; they may have been long-lived birds. The one cited earlier, which used the words 'Gee up, Bess,' was known to have been about the farm for 20 years.

The question whether birds teach their young to mimic is also an open one. Many bushmen hold that spotted bower-birds do so, not merely by casual force of example, but deliberately. It is certain, of course, that the song or call of its kind is born with every bird; but it is probable that tuition is required for the young of species whose songs or calls are complicated. A blue wren kept in captivity could only articulate half a bar at the end of 18 months. Definite tuition is not given by all parent-birds, however, for in most cases the offspring leave their parents before they have acquired a thorough grounding in music or 'elocution.' Probably this fact in itself plays a part in the development of mockery; and assuredly both mockery and improvization are prominent factors in the evolution of bird-song. A.H.C.

Mock Orange. See CAPPARIS.

Moffat, JOHN (1841-1918), born at Newmilns on the Irvine in Ayrshire on 26 May 1841, was in boyhood apprenticed to an ironmonger in Glasgow. Threatened with pulmonary trouble, he migrated in 1862 to Queensland, and obtained work on a Darling Downs station as storekeeper

and ration-carrier. Returning to Brisbane, he worked for an ironmonger there, then set up a store of his own in South Brisbane, and about 1869 moved to Stanthorpe on the border of Queensland and New South Wales, where he soon became interested in alluvial tin-mining. In 1880, hearing that payable tin had been discovered near Herberton in northern Queensland, on the tableland behind Cairns, he moved to that field, imported tin-dressing machinery, encouraged and took part in the opening up of tin, copper, and silver mines farther west, established headquarters at Irvinebank, and became known as 'the father of tin-mining in the north.' The Chillagoe mines and railway, and the Mount Elliott mines near Cloncurry, owed a great deal to his support, and he readily backed any prospector in search of tin, lead, silver, copper, bismuth, molybdenite, or wolfram. For some years a large proportion of the world's supply of wolfram passed through his hands. His active life from 1880 onwards was spent in the region he had opened up, where (besides the Herberton and Chillagoe enterprises already mentioned) he organized the exploitation of silver-lead at Muldiva (1890); copper at Mount Garnet and Mount Molloy (1898-1902); tin at Irvinebank (1883) and Coolgarra (1898); wolfram at Mount Carbine and Wolfram Camp (1899-1902); and coal at Mount Mulligan (1910). He also constructed lines joining Irvinebank and Mount Molloy with the main railway-lines. In 1912 he retired from the direct management of his northern properties and settled in Sydney. He died at Toowoomba on 28 June 1918, while on a business visit to Queensland.

Mole, Marsupial, a remarkably modified polyprotodont marsupial belonging to the family Notoryctidae. There are two species. One (*Notoryctes typhlops*) is confined to sandhills in central Australia, its discovery being made known to science as recently as 1888 by the late Sir E. C. Stirling (q.v.). It is a small animal, the head and body together being about five or six inches long, and the tail about an inch. The body is flattened from above downwards, and there is no neck; the snout is protected by a horny shield; the fore- and hind-limbs are nearly equal, very short and strong, and specially modified to act as burrowing-organs, the claws of the third and fourth digits of the fore-limb being enormously developed. The fur, which varies in colour from silvery to chestnut-brown, is long, soft, and silky. The tail is reduced to a rudiment and the skin is hard, rough, and marked with rings. The eyes are incompletely developed and buried beneath the skin, so that the animal is completely blind; the external ear is absent; the pouch opens backwards.

A second species (*N. caurinus*) was found at Wollal, near the Ninety-mile beach in north-western Australia, and described in 1920 by Oldfield Thomas of the British Museum. The general colour above was approximately 'pinkish cinnamon,' paler below. The claws and nasal pad are smaller than in *typhlops*, but the main distinction is shown in the skull, with its shorter muzzle and reduced dentition.

The food of the marsupial mole consists of ants and insects, in search of which it digs its way through the sand immediately beneath the surface, emerging at intervals to breathe. The burrows made in search of food are not permanent like the tunnels left by the European mole, though it is probable that deep permanent burrows are constructed in which the female lives when rearing her young. In captivity Professor Wood Jones has observed a handful of earthworms being noisily accounted for, while a specimen held in the hand partook of a quantity of milk. See MARSUPIALS. W.A.H.

Mole Crab. See HERMIT CRABS.

Molesworth, SIR ROBERT (1816-1890), born at Dublin on 3 November 1816, and educated at Trinity College, Dublin (B.A., 1826; M.A., 1833), was called to the Irish bar in 1828 and joined the Munster circuit. In 1852 he migrated to South Australia, but came to Melbourne in 1853, was admitted to the Victorian bar, and during the absence of Sir William à Beckett (q.v.) acted as chief justice. In November 1855 he became solicitor-general in the Haines ministry, in June 1856 was placed on the supreme court bench, and under a new statute became primary judge in equity. He frequently sat in the common law and criminal courts, and was the first judge of the court of mines. From August 1885 to May 1886 he acted as chief justice during the absence of Sir William Stawell. He retired on a pension in 1886, and died on 18 October 1890. J.V.C.-B.

Molle, GEORGE, joined the army in 1793 as an ensign (lieutenant, 1794; captain, 1795; major, 1803; lieutenant-colonel, 1808; colonel, 1814), served at Gibraltar and the Cape of Good Hope, and acted as aide-de-camp to Sir David Baird in India and Egypt. In 1803 he was sent to England with despatches, saw active service during the continental wars, and on 3 June 1813 was appointed lieutenant-colonel of the 46th foot, then under orders for New South Wales. On 20 June he was also commissioned lieutenant-governor of the colony. Reaching Sydney on 11 February 1814, he was welcomed by Governor Macquarie (an old comrade-in-arms under Baird), and on 28 March took the oaths of office. But the friendly relations between Macquarie and Molle did not last long. Before reaching the colony the officers of the 46th regiment had decided, with the tacit consent of their chief, not to invite to their mess any person who had been a convict; they had to meet emancipists at the governor's table, but would not otherwise associate with them. Macquarie was annoyed, but admitted their right to choose their own companions, and there was no open breach until 1815, when some of Molle's officers began to exercise their wit on the governor and his friends. In 1816 they applauded a caricature of him, and declined invitations to government house. About the same time a scurrilous lampoon on Molle was circulated through the town (see 'PIPES'); Molle, extremely angry, could not discover the author until D'Arcy Wentworth (q.v.) admitted that it had been written by his son William Charles—who by that time was on his way to England. The officers of the regiment, thus freed from suspicion, presented Molle with a congratulatory address, which in Macquarie's opinion embodied an attack on his administration; this put an end to any non-official intercourse between Macquarie and Molle, and Macquarie drew up a list of charges against the officers collectively for presentation to the commander-in-chief. Meanwhile Molle summoned D'Arcy Wentworth before a court martial, on the ground that he had aided and abetted the circulation of his son's lampoon; Macquarie, though considering the charges

of 'a most frivolous and ridiculous Nature,' ordered the court to be assembled, but his legal adviser the judge-advocate considered that a colonial medical officer was not subject to court martial, and the proceedings fell through. On 23 September 1817 Molle left Sydney with his regiment for Madras, where he died on 9 September 1823.

Mollusca. The *mollusca nux* of the Romans was a soft-kernelled nut with a thin shell. The transference of the name to shellfish was easy: and, though for scientific reasons cuttle-fish, slugs, and a few other animals not enclosed in shells are classified among molluscs, yet the vast majority of the species, whether they inhabit sea or land or running streams of fresh water, are protected by a calcareous shell. Among the higher invertebrata the division Mollusca is marked by a lack of such segmentation as occurs in insects, crustacea, and the higher 'worms' and of such radial symmetry as distinguishes the Echinodermata. About 50,000 living species of molluscs have been recorded, but less than 5000 have been recognized from Australia. A complete census, however, would add materially to the world-population, and proportionately more to the Australian. Some molluscs are viviparous; in some, e.g. cuttle-fish, several larval stages are rehearsed in the egg; but the normal mollusc lays eggs from which are hatched larvae destined to undergo complicated transformations. The earlier of these repeat the history of such forms as the chaetopod worms; the larvae, for instance, swim by means of quivering bristles set round the head. When this phase is prolonged, the infant mollusc may take advantage of winds and currents to perform long journeys. This is the secret of the wide dispersal of the oyster and other sedentary forms.

Mollusca have nerve-centres concentrated in the head, forming a sort of invertebrate brain. They can feel, see, and hear more or less acutely. Their blood is oxygenated by a gill or lung (or even by the cuticle), filtered by a kidney, and pulsated by a heart; but the ultimate ramifications of the circulation are indefinite. Their sex may be either monoecious or dioecious. The molluscan foot, perhaps developed from the ventral sucker of a worm, has been elaborated into a variety of shapes and uses, from the creeping sole of the snail to the fin of the heteropod, the tentacle of the squid, the spade of the pipi, and the auger of the cobra. The shell, which has passed through complicated phases of evolution and degeneration, is often provided with a lid (operculum) that closes the opening like a door. Another characteristic molluscan feature is the radula, which has a general resemblance, both in position and in function, to the tongue of a vertebrate. It is a hard, transparent, chitinous structure consisting of minute plates arranged like a pavement, each bearing a backwardly directed hook or prong. With this instrument a carnivorous gasteropod can drill a hole through the shell of its victim, and tear out the flesh afterwards. The pattern of the radula-teeth is varied, and is a useful criterion in classification.

To savage races molluscs are of far more importance than they are for any civilized people. Probably no mollusc of sufficient size has ever been neglected as food. From various shellfish the Australian aborigines derived subsistence, implements, and ornaments. Old native camps round Sydney are still marked by huge piles of bleached and broken shells of the larger species (such as *Cymatium*, *Turbo*, and *Haliotis*) intermingled with lesser kinds such as the limpets; even the chitons were not despised. A cockle (*Arca trapezia*), occurring in sheltered bays, yielded so plentiful a food-supply that MacGillivray described the stacks of discarded valves at Brisbane Water as extending for 100 yards in length and 20 feet in height. Various species of a mussel (*Diplodon*) from freshwater pools were esteemed either raw or roasted. A valve of some large stout bivalve was generally carried in a basket to serve as a knife. Fish-hooks were rasped out of various

Turbo stamineus.

shells. In the tropics the melon-shell was used as a canoe-bailer, the *Megalatractus* as a bucket, the *Charonia* as a trumpet, and the giant clam as a tank. From pearly nautilus, which are stranded all along the Pacific beaches, the coastal tribes used to cut the septa, fashion them into ornaments, and trade them to inland tribes. Pearl shells were carved into crescents and slung across the chest by natives of northern Queensland. The Tasmanian aborigines used to decorticate and string together the iridescent *Cantharidus*, which is now sold in Hobart to tourists.

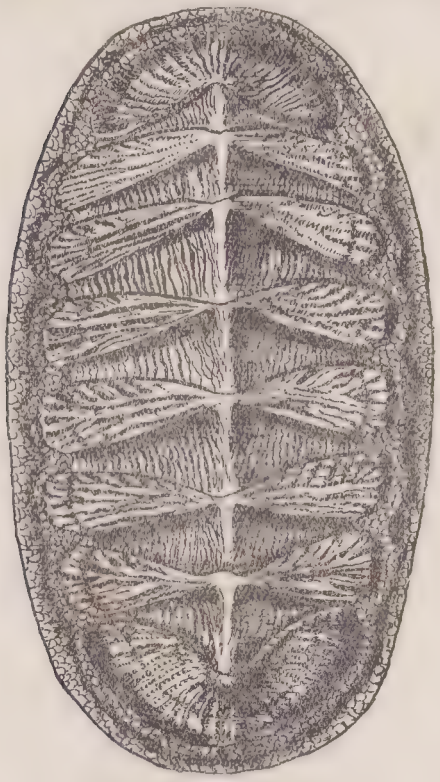
The Amphineura, the lowest grade of mollusc, more nearly represent the ancestral form, being straight and bi-laterally symmetrical. On the back are eight overlapping shelly plates set in a band of muscle, which resemble the plates of armour worn by medieval warriors and suggested the name of chiton (mail-clad) for the tribe. The muscular periphery, which is usually scaled on the outside—the scales appearing in *Sypharochiton* like a tessellated pavement, and in *Acanthopleura* like a forest of spines—enables the chiton to cling firmly to rocks.

The chiton fauna of Australia is unusually rich, amounting to about 130 species; they occur along the whole coast, but are most abundant in the colder southern waters; each species is usually restricted to a particular zone on the beach. Many interesting and peculiar forms are included in this fauna. *Schizochiton*, a tropical form, has developed an elaborate series of dorsal eyes, which like sparkling beads stud the surface of the valves. The genus *Cryptoplax* has progressed furthest in the reduction of the plates, thus acquiring a suppleness by which it is able to worm itself into the smallest crevice. The species of *Stenochiton* seek an unusual refuge in the axils of the ribbon-like leaves of the sea-grasses *Zostera* and *Posidonia*.

The Cephalopoda (octopi and squids) are accounted the most elaborately organized of all

1. *Oliva sericea* (Barrier Reef).
2. *Spondylus wrightianus* (Western Australia).
3. *Janthina violacea* (Sydney).
4. *Trigonia lamarckii* (Sydney).
5. *Lambis scorpius* (Barrier Reef).
6. *Mitra mitra* (Barrier Reef).
7. *Scaphella bednalli* (Northern Territory).
8. *Strombus luhuanus* (Barrier Reef).
9. *Turbo petholatus* (Torres Strait).

mollusca; they are also the most active, the largest and the oldest survivors of the sub-kingdom. Their body usually takes the shape of a sack. In the lower part of the bag are the viscera; on the constricted neck are two large,



Ischnochiton australis.

highly developed eyes, together with a slit and funnel for inspiration and expiration. The entrance of the sack is slashed to form eight or ten long arm-tentacles, beset with rows of suckers. In the centre of the disk formed by these tentacles is a mouth, armed with a pair of jaws like the beak of a parrot. Most cephalopods have an internal shell and a bag of ink. An old-world name for the squid was 'sea-clerk,' because, the fishermen said, he always carried with him his pen and ink. This ink is the sepia of commerce. In time of danger the squid squirts from the funnel a cloud of sepia ink in which it vanishes from the sight of an enemy. There is nothing in the sea more mobile than a cephalopod, for it can crawl away on its arm-feet, swim with its arms and fins, and dart backwards by driving water from the respiratory funnel. Most cephalopods can change colour like a chameleon, and so conceal themselves by taking on the colour of the background, whether rock or sand. In the North Atlantic are giant squids, exceeding 40 feet in length, but only species of moderate dimensions occur in Australian waters.

The white, brittle, and graceful shell of the paper nautilus (argonaut) is a nest rather than a house; fleets of these shells are sometimes stranded on Australian beaches. The pearly nautilus, whose nacreous whorls are partitioned into many chambers, lives on the Barrier Reef. During aeons of geological time this animal has changed less than almost anything in the world. The little post-horn shell of *Spirula* is commonly stranded on every beach of this continent; the animal, which is considered a rare prize by zoologists, probably lives in deep water off shore. The Australian octopus, squid, and cuttle-fish are much the same as in other parts of the world, and are chiefly valued as bait for fishermen.

The bivalve Pelecypoda include the cockle, the oyster, and the mussel. Their soft body is boxed up in a hard, scarcely penetrable pair of shells hinged together, which may be thrown open by a spring and shut by the contraction of bands of muscle. This safe refuge is purchased at the cost of a comparatively inactive life, and has consequently entailed considerable atrophy and degeneration. Oysters and the oyster industry are discussed separately. Among mussels *Mytilus planulatus* is excellent eating, but is not generally known or appreciated. A fine scallop, *Pecten meridionalis*, occurs in Tasmania, but the fishery is restricted. The Pipi (*Donax deltoides*) is a smooth, wedge-shaped, purple bivalve about two inches long, abundant in temperate waters on ocean beaches, where it may be found sunk in the sand in the wash of the surf. The aborigines consumed it largely; modern fishermen use it for bait. 'Pipi,' the name in use in New South Wales, has been adopted from the Maori; in southern Queensland it is known by an aboriginal name, 'ugarie.'

'Bone' or pen of *Sepia mestus*.

Pearl oysters (for which see PEARLS AND PEARLING) are the most important of Australian bivalves.

On the reefs of the Barrier occurs that largest of bivalves, either recent or extinct, the Giant

Clam (*Tridacna gigas*). The heaviest known pair of shells of this species are the famous holy water basins of the cathedral of St. Sulpice in Paris, which together weigh 550 lb.; the maximum size recorded is a length of four feet six inches and a breadth of two feet five inches. The huge shells lie loose on the surface of the

Tridacna elongata.

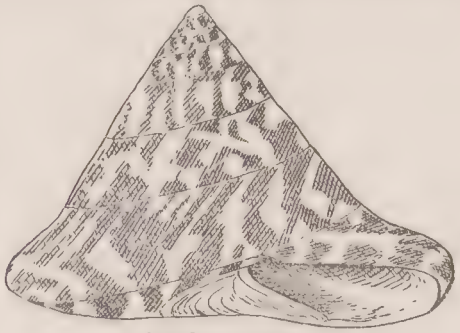
coral-reefs, with the hinge underneath, and when they gape a brightly-coloured mantle is displayed. Captain Cook used these giant cockles as fresh meat for his crew, finding a single one more than a hungry sailor could eat at a meal. A later explorer in Torres Straits, Matthew Flinders, says that on a waterless islet native sailors had improvised tanks by laying out *Tridacna* valves to catch the rain-water. On coral islands, where hard stone was unprocurable, the Polynesians often fashioned axe-heads from *Tridacna* shell.

Trigonia shells are beautifully pearly within, and externally are ribbed with rows of beads; jewellers make brooches and spoons of them. From a geological point of view this genus is of extreme interest because, while all living species are confined to Australian waters, a hundred other species flourished in European seas during the Jurassic and Cretaceous epochs. *Trigonia* is more abundant and of a larger size in Tasmania than elsewhere, but in one form or another is represented everywhere on the Australian coast. Nine species of shell are figured on plate xxvii.

All these bivalves are serviceable to mankind. One, however, is a pest to civilized humanity. In every sea shipworms (*Teredo*) are represented; those that occur in Australian waters have received locally the name 'cobra,' and one that bores a hole an inch in diameter is among the largest in the world. No vegetable substance, hard or soft, seems to be immune from cobra, whose depredations reach from the surface to any depth. The piles of wharves, bridges, or beacons, the hulls of ships, boats, or punts, any submerged timber, floating or fixed, may be quickly riddled by this pernicious mollusc; in the tropics its activities may even extend into fresh water. The attack is commenced by a larva of invisible size, attracted to the timber by a sense analogous to that of smell. A pin-hole in a sheath of metal is ample entrance for the minute visitor which, settling on the wood, rapidly develops adult features. The burrow is excavated not for food but for shelter, as is shown by the wall of shell that lines the tunnel, sometimes to its end. To suit the special circumstances of its existence, the cobra assumes an elongated-worm shape. At its upper and narrower end are two slender tubes (siphons) which reach outside the burrow and obtain both water for respiration and food in the form of floating animalculae. At the lower and thicker end the shipworm has a ring of shell (modified valves), and projecting through the valves is a tough knob, the foot. When boring, the walls of the burrow are gripped by the expanded valves, whose surface is roughened for this purpose, and from the fulcrum thus obtained the foot rasps at the end of the burrow. This action can be heard by putting the ear to an infested pile or plank. The cobra which has entered a boat may be destroyed by drawing the boat out of water and allowing it to dry. An infested pile may be cured by enclosing it in a larger cylinder of metal or canvas, and filling up the intervening space with sand, thus choking the cobra. The usual methods of protection are to give the wood an impenetrable coat either by charring with fire or by sheathing with copper or tar; but logs so coated are safe only as long as there is not the slightest hole to admit the floating larva.

The Gasteropoda (snails, limpets, etc.) compose the most numerous, varied, and characteristic order of molluscs. This group has spread from seas to rivers, and thence to the land. Some species have degenerated into parasites on Echinodermata, others harbour parasites hurtful to man. Usually the body is ensconced in a convoluted shell, but this may be reduced to a cup or plate, or be altogether lost. Originally this shell was an elongated cone like a worm-tube, closed with a movable door (operculum). To render it more compact and convenient for transport, the originally straight shell was rolled up into a spiral; then the coils set up such a strain that organs on the compressed side of the body were atrophied. The paired gills and other organs, which had been symmetrical in the primitive mollusc, were thus reduced to odd, lop-sided expressions. The operculum, which once probably grew turn for turn with the original spiral, ceased to revolve, developed various eccentric forms, and frequently disappeared.

Not many gasteropods are of economic interest. Of late years the demand by button manufacturers for mother-of-pearl has greatly increased, and as former sources became exhausted, fresh material has been eagerly sought. *Trochus niloti-*



Trochus niloticus.

cus (called in the trade 'trocas' shell) came into use. It is a top-shaped shell, about three inches high, coloured with broad stripes of alternate red and white, beneath which is solid mother-of-pearl. It was formerly abundant on the coral-reefs of northern Australia, but through vigorous collecting has become comparatively scarce. The shells are gathered by hand, cleaned of the fish by boiling or rotting, and then bagged up for the Japanese market. The animal is sometimes smoked and exported also. In the factories the shell is by machinery cleaned of its coloured

exterior and cut into disks. These, when smoothed, perforated, and carded, are pearl buttons finished for the market. Abroad it is illegal to take *Trochus* under a diameter of eight centimetres, but no such restrictions are placed upon the industry in Australia.

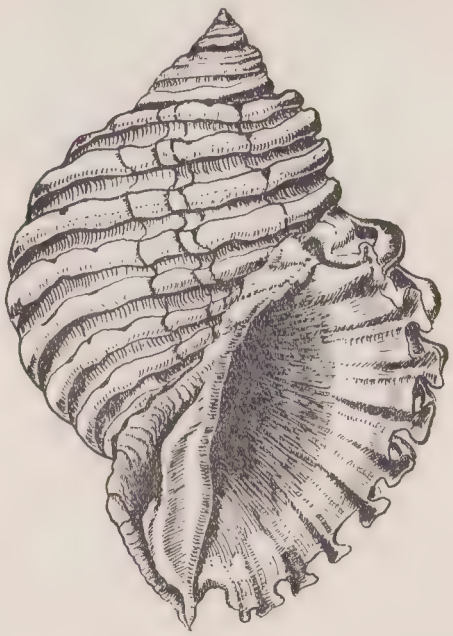
Seldom are gasteropods injurious, but an Australian species is capable of inflicting severe injury, and even death. *Conus geographus*, a gaily-painted, cylindrical shell about three inches long, lurks under stones on coral-reefs, but is so uncommon that few Europeans see it alive. The salivary glands of this and the related species *C. textilis* and *C. tulipa* excrete a venom, the poisonous effects of which resemble those of curari, and the radula has developed long, sharp points by which *Conus* stabs its victim and administers a minute dose of poison. The stab is extremely painful, and quickly disables the sufferer; control of the muscular system is lost (though the heart and lungs remain unaffected), and the limbs are rapidly paralysed. The paralysis continues for several hours, and may end fatally. The native method of obtaining relief is to cut the flesh round the wound, inducing blood to flow.

Any one of the numerous species of *Bullinus*, a genus of freshwater snails commonly occurring in ponds throughout Australia, may be the intermediate host of the liver-fluke of sheep. *Bullinus* is also dreaded as a potential harbour for bilharziosis (see BLOOD-FLUKES).

Haliotis is a saucer- or spoon-shaped shell, lined inside with brightly iridescent pearl, and pierced by a row of holes parallel to the margin. It clings to rocks like a limpet. In Australia it is called 'mutton-fish,' in New Zealand 'pawa,' in California 'abalone,' and in England 'ormer' or 'ear-shell.' Species of *Haliotis* occur everywhere on the Australian coast; some southern

Haliotis naevosa.

forms may reach a diameter of five or six inches. In Tasmania the coastal blacks formerly relied on *Haliotis naevosa* as an important article of food. They dived for the shell, detached it from the rock with a wooden knife, and carried it away in reed-baskets. In 1869 a party of Chinese at Southport in Tasmania prepared *H. naevosa* for export by cutting the mutton-fish from the shell, drying it in a slow oven, and packing it in casks for the Chinese market. At Twofold Bay P. P. King found the aborigines using the shell for drinking-vessels. Characteristic of rocky, surf-swept headlands is the genus *Thais*, in which a large and solid shell is fortified by various devices. The Sydney species develops massive rings, which are so prominent that Chemnitz, an eighteenth-century conchologist, proposed, on account of the intervening furrows, to call it the 'cart-rut' shell. The Conch-shell (*Charonia tritonis*) is found on the northern coasts of Australia. Polynesians and Melanesians used it in peace or war to blow a loud warning signal. An even larger conch—the largest recent gasteropod shell, indeed, in the world—is *Megalatractus aruanus*, which reaches a length of two feet, and ranges from Fremantle to Torres Straits, and thence to Port Curtis. The aborigines ate the mollusc, and manufactured the shells into trumpets, nose-pins, and water-carriers. But to them the most useful of all molluscs was the Melon or Bailer-shell (*Cymbium flammeum*), which served for a canoe-bailer or cooking-pot, or for personal adornment; the animal was also eaten. The shell is large, smooth,



Thais succincta.

and oblong, a foot long, prettily marbled with orange, white, and brown, and with a crown of arched scales at the narrower end. Also common on coral-reefs is the Spider-shell (*Lambis lambis*). It is about eight inches long and very massive; the outer lip is produced into a series of claws, the inner is polished and rose-coloured. South Sea islanders carved the solid shell into various implements, and ate the animal.

Cowries have always been admired for their splendid polish and beautiful colour. Some have been disinterred from the graves of prehistoric people, who prized them as charms for fertility. The Money Cowrie (*Cypraea moneta*), which once passed as current coin in Africa, is plentiful in Queensland. A large white shell, inhabited by a black animal, is called the Poached-egg (*Ovulum ovum*). Many other species occur in Australian waters, including those most prized by amateurs. Limpets, as elsewhere, are scattered over the rocks between high and low tide levels, exposed to the utmost fury of the surf. The species commonest around Sydney is *Cellana variegata*. After an easterly gale the drift-line on any Pacific beach may be adorned with a long purple streak—thousands of wrecked, frail, purple *Janthina*; one species is about the size

of a pea, another resembles somewhat in size and shape the garden snail. Fast to the purple snail is bound a little raft of packed bubbles composed of mucus, which float the animal on the surface and on which the eggs are laid and hatched.

Cypraea lynx.

The Australian land-shell fauna is still incompletely known, new species remaining to be described probably from every State. Queensland, into which a fauna descended from New Guinea by way of Torres Straits, is richest both in number of species and beauty of specimens. To this region are confined the operculate snails (*Helicina, Pupina, Pupinella, Leptopoma,* etc.), which gradually dwindle away southwards till the last straggler, a *Helicina,* is reached at Port Macquarie. Large and handsomely-banded *Hadra* characterize the Queensland coast, occurring on the ground in the jungle or cedar-brushes; with them are species of *Hedleyella* of the size of an apple, coloured in shades of brown and chestnut. The trunks and leaves of the trees are inhabited by species of *Papuina.* Usually each of these ranges over a few degrees of latitude, and is then succeeded by a related form. The carnivorous snails are exemplified by *Rhytida,* with discoidal, glossy, chestnut-brown shells. Slugs, which are fewer than in other countries, are represented by the indigenous genera *Atopos, Aneitea,* and *Cystopelta.* Even the arid regions of central Australia have a few species of snail, which have become adapted to desert conditions.

The Tasmanian fauna, which has been more closely studied than the Australian, includes about 56 species, mostly small, flattened, and radially-sculptured shells belonging to the Endodontidae. There are, besides, a variety of carnivorous species, a single *Helicarion* and a *Chloritis.* The Macroogona are represented by two large and showy monotypic genera, *Caryodes* and *Anoglypta.* An arboreal *Bothryembrion* is a distant member of a great South American family, Bulimulidae. Further, a considerable number of European snails and slugs have established themselves in the settled districts throughout the Commonwealth. C.H.

Mollymawk. See ALBATROSSES.

Molucca Beans. See CAESALPINIA.

Molybdenum, a rare metal occurring in many parts of the world but usually in such small quantities as not to be available for commercial treatment. The world's supply is chiefly obtained from Quebec in Canada, Cumberland in England, Norway, and Australia.

In Australia it has so far only been mined in commercial quantities at Everton in Victoria, on the Chillagoe field in Queensland, and at Kingsgate, Deepwater, Bolivia, and other places in the New England district of New South Wales. The only ore of molybdenum is the sulphide (molybdenite); this, not the metal, is taken as the basis of market transactions, the price quoted being so much per unit of molybdenite—one unit is 22.4 lb., or one-hundredth of the number of pounds in one ton.

Formerly the uses of molybdenum were very limited, but since it has been discovered that its presence in steels increases their tensile strength, elasticity, and hardness, it has been in greater demand. Molybdenite has to be dressed up to at least 85 per cent, and must not contain more than 0.5 per cent of bismuth. To free it from other minerals, the ore has to be broken up. No one machine can do this satisfactorily, so the reduction takes place in stages, the class of machine employed for each stage depending on the size required. It is first reduced to about half an inch in one or more rock-breakers; from these it is passed on to rolls, where it is crushed so as to pass through a screen with ten holes to the linear inch; finally it is reduced so as to pass through a screen with 24 holes to the linear inch, the best machine for this being a ball-mill of the Krupp type. All this crushing is done in the dry state; the final product is passed over a shaking screen, and the oversize is returned to the ball-mill.

Molybdenite does not lend itself to concentration by gravity, because it breaks up into flakes and, in spite of its high specific gravity, easily floats away; but treatment on jigs and tables will help to get rid of certain associated minerals. At small isolated deposits, should the molybdenite occur in sufficiently large pieces, cobbing and hand-picking are resorted to. The most satisfactory method of treating molybdenite is by flotation, for which two methods are in vogue in Australia: (1) surface-tension, developed at the northern Queensland mines, (2) the mineral separation or frothing method. The former produces a higher-grade concentrate; the latter saves more molybdenite, but is not so clean, more impurities being carried over and the grade thus reduced.

The Irvinebank type of surface-tension consists in mixing the mineral pulp with oil (generally kerosene); this is fed by a shaking screen to a slightly inclined board, the lower edge of which dips under water at one side of an inverted pyramidal box. The molybdenite floats across the surface of the water to an overflow lip on the opposite side, and then passes to a settling-box, while the residue sinks to the bottom and is delivered through a spigot

to the shaking feeder of the next box. There are four such boxes to a system.

In the frothing process the dry, powdered material is passed into a trough-mixer, where it is stirred up with the necessary quantity of water and about ¾ lb. to one lb. of eucalyptus oil per ton of ore, and passed into the top end of a six-cell flotation machine. The details of the work vary with the nature of the ore. If the ore is low-grade, a larger quantity can be handled in a given time than if it be higher-grade. Further, low-grade froth from the last three cells may be returned to the first cell for re-treatment, whereas if the ore is high-grade it may be only necessary to return the froth from the last cell. Sometimes a little sulphuric acid and carbonate of magnesia (or lime) are added to assist the float. If bismuth sulphide is present in the ore, it is apt to rise in the boil of the last one or two cells, but the addition of more oil at this point prevents this action. The froth is run into settling-tanks, where it is allowed to remain for about eight hours (a little sulphuric acid being added to help the settling); the water on the top is then syphoned off. If the concentrate still contains over 0.5 per cent of bismuth, the ore has to undergo further treatment in a sub-aeration machine; this machine consists of a cylinder, the lower two-thirds of which is divided into compartments by ten sheet-iron baffle-plates, set at a tangent and extending from a central tube to the periphery: below this a stirrer, actuated by a spindle that passes through the central tubing, revolves at the rate of 840 revolutions per minute. Air passes into the bottom of the machine through a pipe, while water is admitted through the side from another pipe connected with the apparatus a little above the bottom. The concentrates may be added intermittently as a charge by hand, or continuously and automatically by machinery. When set in motion, the molybdenite rises to the upper part of the cylinder as a froth, and flows from the lip to a settling-tank; the water is drawn off, and the sediment dried over a furnace. The bismuth sinks to the bottom of the sub-aeration machine, and is drawn off through a hole at the bottom.

In 1925 from the quantity of molybdenite ore raised in the Commonwealth 870 cwt. of concentrates, valued at £7464, were produced. Over 70 per cent of this yield came from Everton near Beechworth in Victoria, about 15 per cent from the New England district of New South Wales, and the rest from the Chillagoe and Mount Perry districts of Queensland. Molybdenite also occurs at Moonta and Yelta in South Australia, at Yenberrie in the Northern Territory, and sporadically in Western Australia. See MINERALOGY.

F.D.P.

Monash, SIR JOHN, born at Melbourne on 27 June 1865 and educated at the Scotch College and the university of Melbourne (M.C.E., 1891; B.A., 1895; LL.B., 1895), in 1884 commenced practice as a civil engineer. In 1900 he introduced reinforced-concrete construction into Victoria, Tasmania, and South Australia; in 1913-15 he was president of the Victorian institute of engineers. From his university days he was an enthusiastic officer of the citizen forces, and his power of keen, lucid exposition was noticed by Sir Ian Hamilton and other inspecting officers who visited Australia. In 1887 he received his first commission (lieutenant, 1887; captain, 1895; major, 1897; lieutenant-colonel, 1908; colonel, 1913; brigadier-general, 1914; major-general, 1916; lieutenant-general, 1918), in 1901 he commanded the North Melbourne artillery, and from 1907 to 1914 was an officer of the intelligence corps; on the outbreak of war he was appointed chief censor for Australia. Within a month, however, he was given command of the 4th infantry brigade, which became part of the New Zealand and Australian division under Major-general Godley. He accompanied his brigade to Gallipoli, where during the landing operations it reinforced the battalions holding the centre and shortly afterwards became responsible for the defence of that sector at the head of Monash Valley. In the great offensive in August his brigade was given the task of reaching, by a night operation through the foothills, the summit of Hill 971, some four miles distant. In the morning, at a critical moment, Monash himself made his way to its head and directed it into the hills, but the effort failed. Shortly after the transfer of his brigade to France he was appointed to command the 3rd Australian division, which he trained in England and led to the western front, where it took part in the battle of Messines, the third battle of Ypres, and the operations which checked the direct German advance upon Amiens. His obvious capacity, especially in the higher commands, marked him to succeed General Sir William Birdwood in command of the Australian army corps in France when, in May 1918, Birdwood was transferred to the Fifth British army. In the elaborately planned action at Hamel on 4 July 1918 the new corps commander showed what could be done by the careful co-operation of infantry with tanks, aeroplanes, and artillery; and his methods thus tried were to a large extent subsequently adopted in the British offensive of 8 August. Partly in consequence of that ascendancy established by Australian troops over the enemy confronting them which was impressed by Monash upon General Rawlinson, commander of the Fourth army, the sector of the Australian Corps was chosen for the commencement of the Allied offensive of 8 August 1918. Monash's plans for the operation of his corps were entirely successful, and during the advance he at times commanded no fewer than eight divisions. When the advance reached the southward bend of the Somme at Péronne, his clever transfer of two divisions to the north bank resulted in the capture of Mont St. Quentin and the turning of the German position. By 6 October when the Australian divisions, after the piercing of the Hindenburg line, were withdrawn for rest, Monash had become recognized as one of the ablest corps commanders in the British army. After the armistice he was appointed director-general of demobilization for the A.I.F. (see AUSTRALIAN IMPERIAL FORCE). In 1920 he published *The Australian Victories in France in 1918*, which described the work of the army under his command and laid stress on the part played by engineering in modern warfare; this won him the degree of doctor of engineering, the first granted by any Australian university. In August 1920 the Victorian government appointed him chairman of the State's electricity supply commission (see YALLOURN). In 1924 he was president of the Australasian Association for the Advancement of Science. (C.B., 1915; K.C.B., 1918; G.C.M.G., 1919.)

C.E.W.B.

Monazite. See MINERALOGY.

Monimiaceae, a family of trees, shrubs, or woody climbers, largely represented in tropical

South America, with a few widely scattered extra-tropical species. *Hedycarya angustifolia* (Native Mulberry) a small tree with unisexual flowers on distinct plants, is an endemic species ranging from Victoria to Queensland. The aborigines of southern New South Wales used the wood of this tree for spear-heads, and for producing fire by friction. *Palmeria scandens*, a graceful vine found sparingly in New England (New South Wales), is rich in a pure tonic bitter, and for many years formed the basis of a minor local industry, being exported to the continent of Europe for use in the manufacture of beer. See DAPHNANDRA and SASSAFRAS.

Monkey Nut. See HICKSBEACHIA and PEANUTS.

Monk-fish. See ANGEL SHARK.

Monotoca, a genus of the family Epacridaceae, consisting of shrubs or small trees with more or less unisexual flowers crowded on short spikes, endemic in Australia. *M. elliptica*, the 'Port Jackson Beech' or 'Pigeon-berry' ('wallang-unda' of the aborigines), is a small tree with a silvery-grained timber. It must be planed across the grain, and was formerly used for planes and other carpenters' tools. *M. scoparia* has a pale-yellow wood, nicely marked and easily worked.

Monotremes. The term 'monotreme' (i.e. 'single opening'), first applied by Etienne Geoffroy Saint-Hilaire, refers to an anatomical feature which they share with birds, reptiles, and amphibians—the single aperture or 'vent,' which is the sole outlet of a chamber (cloaca) common to the intestinal canal and the urinary and reproductive systems. Another peculiarity in which these mammals resemble birds (as well as the other classes of lower vertebrates) is that in monotremes the two oviducts are separate throughout their entire extent, instead of undergoing various fusions as in all other mammals.

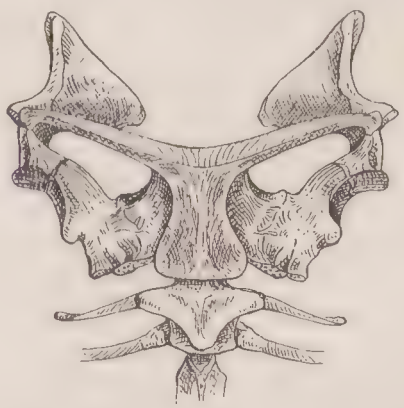
They belong to the lowest order of mammals, and differ from all other mammals in certain important features of their structure and development, in several of these approaching reptiles and birds. It is uncertain whether any of the known extinct mammals were monotremes, but the only surviving representatives of the order are the Platypus (*Ornithorhynchus anatinus*, also known as *O. paradoxus*), the Native Porcupine or Echidna (*Tachyglossus aculeatus*)—also called 'native hedgehog' and 'spiny anteater'—and the three-clawed and five-clawed *Zaglossus* (*Proechidna*) of Papua (see ECHIDNA and PLATYPUS).

Though the platypus and the echidna are so nearly related that they may be regarded as members of the same mammalian order, the superficial resemblance is not very close, and each is classed as a separate family. Both have a very short, thick trunk and short and powerful limbs, each provided with five digits armed with strong claws; both have the snout-and-jaw region developed into a kind of beak or rostrum; the males of both are provided with a large horny spur, curved and pointed, on the inner side of the hind-limb, connected with a special gland; both have small eyes, and are devoid of the conspicuous outer ear which forms so marked a feature in other mammals. But in other respects the differences between the two animals in appearance, as well as in structure and habits, are very strongly marked.

The platypus is distributed over southern Queensland, New South Wales, Victoria, South Australia, and Tasmania. The echidna (of which there are several varieties) is found all over continental Australia, Tasmania, and southern Papua. The platypus and echidna are described under their own names. Of the two species of *Zaglossus*, *Z. bruijni* occurs in western and *Z. bartoni* in eastern New Guinea. The distinctive character of *Zaglossus* is the great length of the narrow snout or beak, which is about twice as long as the rest of the head and is bent downwards. Six forms of *Z. bruijni* are known, all with three or four claws on each foot; of *Z. bartoni* two forms only occur, and all known specimens have five claws on each foot.

One of the points which render monotremes unique among mammals is that, instead of being viviparous (i.e. bringing forth their young in an advanced condition of development), they resemble the majority of the lower vertebrates in being oviparous (i.e. laying eggs which contain as yet only an imperfectly developed rudiment of the future animal, the further development of which takes place outside the body of the parent). The fact that monotremes lay eggs, repeatedly asserted and repeatedly denied, was authoritatively and conclusively established by W. H. Caldwell in 1883-4.

All monotremes possess the mammary glands, whose secretion serves to nourish the young in the early stages of their existence; but in certain special features, relating to their structure and the nature of their secretion, these glands differ widely from those of all other members of the class. Other distinctive features are to be found in certain parts of the skeleton. One is the presence of a T-shaped bone (episternum, or inter-clavicle) in the lower or ventral part of the skeleton of the trunk; the stem of the 'T' articulates with the sternum or true breastbone; the cross-piece is in close relation to the collar-bones of the fore-limb. Such a bone does not occur (save as an obscure vestige in certain examples) in other mammals, but is well-developed in most reptiles. Another characteristic feature



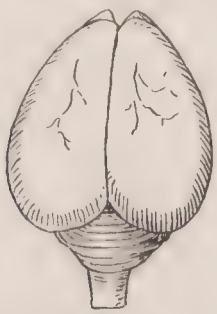
Coracoid bones of echidna (ventral view).

is the presence of complete coracoid bones. In the lower air-breathing vertebrates, the pectoral arch (that portion of the skeleton which supports the fore-limb) consists of three distinct elements —the scapula, coracoid, and clavicle—meeting at the shoulder-joint. In all the higher Mammalia the coracoid element is reduced to little more than a vestige, whereas in monotremes it is a well-developed bone (or rather two bones), joining the shoulder with the breastbone.

As in most marsupials, there are in monotremes epipubic or 'marsupial' bones connected with the

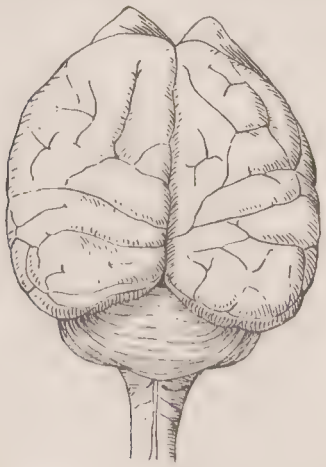
pelvis. The skull also is peculiar, one of the most striking points being that the constituent bones become fused early, the sutures (lines of articulation) being obliterated and the surface assuming a smooth, polished appearance. In this respect, as in the form of the beak, monotremes are superficially somewhat bird-like. Essentially, however, the resemblance is not a close one; the skull, while possessing certain reptilian features not shared with the higher mammals, is very definitely mammalian. The lower jaw, like that of other mammals—and unlike that of reptiles and birds—consists of a single bone on each side. It is greatly reduced as compared with that of other mammals, and the upright part is absent.

The monotreme brain falls short of the normal mammalian standard in certain respects, but not much more so than the marsupial brain. Though in this there is no essential difference between platypus and echidna—since both lack an im-



Brain of platypus (dorsal view, natural size).

portant brain-structure that is present in all other mammals except the marsupials—there is a great difference between the two in brain development: the cerebral hemispheres (the seat of the higher brain-activities) of *Tachyglossus* are larger and much more highly organized than those of *Ornithorhynchus*. This difference is doubtless to be associated with the wide difference in habits and mode of life; the compara-



Brain of echidna (dorsal view, natural size).

tively circumscribed environment of the platypus does not call for, or develop, the same amount of intelligence as that of its more freely roving relative.

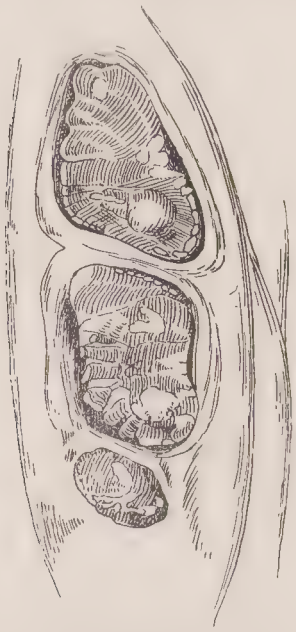
Another difference concerns the organs and nerve-apparatus connected with the olfactory sense. The echidna has the entire apparatus rather highly developed, whereas in the bill of the platypus it is much less elaborate. To compensate for this deficiency in the sense of smell, the platypus has about the beak a system of minute papillae, which seem to be organs concerned with a specially refined touch-sense. To quote Professor G. Elliot Smith (q.v.), to whom we are indebted for the most comprehensive investigation of the nervous-system of these lowly mammals:—

> It can easily be conceived that, as the animal spends much of its time in dark subterranean channels, where impressions of sight and hearing avail little, the sense of touch should be of most service, and, together with the sense of smell, should be a guide sufficient to the needs of this strange creature. . . . But when at dusk the animal leaves its burrow and takes to the water, the sense of smell is of little avail, and the creature may be seen swimming about the surface of some quiet pool, with its sensitive beak just below the surface of the water, responsive to every ripple that marks the surface. At such times vision and hearing can be but accessories to the more acute sense of touch.

Of some interest in connection with the relationship of monotremes to other animals is the observation, first made by Mikluho-Maklay (q.v.) in 1879, that the temperature of the blood in *Tachyglossus* is considerably lower than it is in other mammals. The temperature in the latter (including the marsupials) is comparatively high (36° C. and higher), and very constant; in reptiles it is scarcely above that of the surrounding air, and varies with it. In *Tachyglossus* the temperature averages about 30° C., and is more readily affected by changes in the temperature of the air than it is in other mammals. As pointed out by Wardlaw, however, this peculiarity is by no means so striking as has sometimes been supposed, especially when we compare *Tachyglossus* with mammals belonging to higher groups that pass through a period of hibernation, wherein the conditions as regards temperature approximate to those prevailing in reptiles. In *Ornithorhynchus* the temperature is more constant than in *Tachyglossus*.

While monotremes display features that must be regarded as primitive, additional interest in the problem of their position in the animal kingdom is derived from a recognition of the fact that they are both, in one respect at least, degenerate; the ancestors of the platypus and echidna must have come nearer to the main mammalian stock than do their descendants. The ancestral mammal was assuredly not toothless; yet both the monotreme families are practically devoid of teeth. In the platypus, long regarded as toothless, well-formed teeth were comparatively recently (1889) found by Poulton and Oldfield Thomas embedded in the jaws of the young animal. These are soon discarded: the place of teeth, functionally, is taken by flat, horny plates developed in both jaws, and serving to crush between them the small mussels and similar constituents of the food; in this important function hard, horny plates on the tongue and palate also take a share. But the discovery and close investigation of the structure and development of these rudimentary teeth help to throw light on the question of the relationship of monotremes to other mammals. The teeth are two on each side of the upper jaw, three in the lower, with vestiges of others; they are all grinding-teeth (molars), whose broad surfaces are divided into two main lobes or cusps, with numerous tubercles round the edges.

In *Tachyglossus* teeth are completely absent at all stages: the only tooth-like structure developed in the embryo is the so-called 'egg-tooth' (present also in *Ornithorhynchus*) developed on the upper surface of the snout, and presumably



Teeth of young platypus, in lower right-hand jaw. (View from above—front of jaw at top. x 5)

used for tearing through the egg-shell to enable the young animal to escape. The want of teeth is compensated in somewhat different ways in the two families. In the platypus, as has been said, broad, horny plates are developed in both jaws and the tongue. In *Tachyglossus* there are no horny plates on the jaws, but numbers of little horny structures on the back part of the tongue, working against hard ridges on the roof of the mouth, break up the ants or other insects of which the animal's food is composed. Moreover, the stomach has no digestive glands, and has evidently assumed the character of a gizzard—an organ the function of which is to help not digestively but mechanically in the process of breaking up the food.

Some of the special peculiarities of monotremes may be regarded as adaptations to environment rather than as either primitive or degenerate. Thus in the platypus the webbed feet, the reduced organs of smell with their associated nervous mechanism, and the development of special tactile organs on the beak, are adaptations to an aquatic life: whereas with the burrowing and ant-eating habits of echidnas are correlated the powerful claws, narrow beak, small mouth, and long, protrusible tongue.

With the exception of some remains of two extinct species of *Tachyglossus* and one of *Ornithorhynchus* in the post-Tertiary (Pleistocene) deposits of Australia, the monotremes are not certainly known to be represented by any fossil remains of any age in any part of the world. It has been supposed, however, that the earliest known fossil remains of mammals were remote ancestors of *Ornithorhynchus* and *Tachyglossus*. These remains are grouped together as the extinct order Multituberculata, beginning in small numbers in the Trias of England and Germany, extending in greater force through the Lias of Europe, America, and (perhaps) Africa to the Cretaceous, and dying out eventually, so far as known traces go, in the early Tertiary. The temporary teeth of the young platypus approach more nearly to those of the Multituberculata than to those of any other known form. Hence it is a widely accepted view that these, the most primitive of known mammals, were also primitive monotremes. But evidence which has been comparatively recently obtained, as a result of the study of the skull and other parts of the skeleton of certain American Multituberculata, seems to point to affinities with the diprotodont marsupials rather than with the monotremes.

See J. W. Gidley's notes on the fossil mammalian genus *Ptilodus*, with descriptions of new species, in the *Proceedings* of the United States National Museum, vol. xxxvi (1909). For other general references see MARSUPIALS.

W.A.H.

Moore, MAGGIE (1851-1926), the name by which Margaret Virginia Sullivan, who in 1874 married James Cassius Williamson (q.v.), was for 50 years known throughout Australia and the United States. Born in San Francisco (in the district locally known as 'South of Market') on 10 April 1851, she appeared while still a girl on the local stage, and was in 1873 a member of John McCullough's stock comedy company when J. C. Williamson joined it from New York. At that time Williamson's well-known play *Struck Oil* lacked feminine interest; when Maggie Moore married him, a part was written in for her to sing dialect songs and give imitations of favourite actresses—and within a few years her part was as important to the play as her husband's. Coming with him to Australia in 1875, she shared, and in great measure was responsible for, his successes up to the end of the century; in *Little Nell and the Marchioness* (an adaptation of *The Old Curiosity Shop*) she took the double title-rôle, with Williamson as Dick Swiveller; she was also Mina to his Rip van Winkle. When the company returned to Australia in 1879 she made her own mark independently as Josephine in the first authorized performance of *H.M.S. Pinafore*; in 1882 as the first Australian Bettina in *La Mascotte* (her best singing part), and in 1888 as Meg the Castaway in the play of that name. In 1899 she divorced Williamson, retaining the rights of *Struck Oil*, in which she made many more appearances up to 1912; after the divorce, however, she widened her repertory considerably, and is said to have appeared at one time or another in every form of play except Shakespearian drama. In New York in 1906 she played Gretchen to Thomas Jefferson's Rip van Winkle; she appeared in pantomime in Sydney and Liverpool (England); in Australia after 1914 she was chiefly seen in humorous or dialect rôles of polite or musical comedy. In 1901 she married H. R. Roberts. She was, and remained to the last, one of the most popular actresses on the Australian stage, and her 50th year of association with it was celebrated in Sydney and Melbourne by remarkable demonstrations from her fellow-artists and the public. In 1925 she returned to San Francisco, where on 28 November she was enthusiastically received as the most famous of South-of-Market girls. She died there on 15 March 1926.

Moore, SIR NEWTON JAMES, born at Bunbury in Western Australia on 17 May 1870, and educated at Prince Alfred College in Adelaide, was

articled to Alexander Forrest (q.v.) and trained as a surveyor. He raised the first regiment of mounted infantry in his State, and for seven years (with the rank of major) commanded the 18th Australian light horse. In June 1904 he was returned by Bunbury to the State legislature, joined the Rason ministry in 1905 as minister for lands, succeeded to the premiership in 1906, and held it until 1910. In 1911 he was made agent-general for his State, and since that time has resided in London. During the war he had charge of A.I.F. depots in the United Kingdom, with the temporary rank of major-general. In 1918 he resigned the agent-generalship to succeed Sir George Reid in the house of commons as member for Hanover Square; in 1918-23 he sat for North Islington, and since 1924 has represented Richmond. (C.M.G., 1908; K.C.M.G., 1910.) J.S.B.

Moor-hen. See RAILS.

Moorhouse, JAMES (1826-1915), son of a merchant cutler, was born at Sheffield in Yorkshire on 19 November 1826 and at the age of 16 entered his father's business. A few years later he decided to read for holy orders at St. John's College, Cambridge (B.A., 1853; M.A., 1860). In 1853 he was ordained deacon (priest, 1854), and appointed to the curacy of St. Neots in Hertfordshire; in 1855 he was transferred to Sheffield, in 1859 to Hornsey, and in 1861 to St. John's, Fitzroy-square, London. In the same year he was select preacher to the university of Cambridge, and his four sermons were published under the title *Nature and Revelation.* In 1865 he was Hulsean lecturer at Cambridge. In 1867 he left Fitzroy-square to take charge of Paddington parish, in 1869 was made rural dean of the diocese of London, in 1874 chaplain to the Queen and Warburtonian lecturer, and in 1875 prebendary of St. Paul's cathedral.

In October 1876 he was consecrated bishop of Melbourne in Westminster Abbey, and reached his see in January 1877. There he greatly stimulated church work in the diocese, hastening the erection of many churches and schools, and devoting much zeal to the building of his new cathedral-church—St. Paul's—at Melbourne itself. His influence was felt very widely beyond his own Church; broadminded and eloquent, he attracted men from all denominations; and his advocacy of federation and irrigation, as well as his strong and outspoken views on state education, made him a leader in public affairs. In 1880 he was made chancellor of the university of Melbourne. In 1885, when he was probably the most prominent man in Victoria, and certainly the most notable of the Church of England bishops in Australia, Lord Salisbury offered him the see of Manchester, just vacated by the death of another great bishop, James Fraser. Moorhouse was enthroned at Manchester on 18 May 1886, justifying his desertion of Melbourne by doing even more valuable work in the crowded industrial areas of Lancashire. Entering the house of lords in 1891, he established his position there during the debates of 1902-3 on A. J. Balfour's education bill. But the diocese had worn him out, and in 1903 he retired from active work and lived near Taunton in Devon until his death on 9 April 1915. J.V.C.-B.

Mopoke. See FROGMOUTHS AND NIGHTJARS.

Moraceae, a family of plants closely related to the Urticaceae, from which it has been separated only in recent years. It includes the figs (q.v.), mulberries, and banyans. *Malaisia tortuosa* (Crow-ash) and ranges from Queensland into the Malay Archipelago; its fruits are sometimes used for Christmas decorations. *Pseudomorus Brunoniana* (Whalebone-tree), often called 'crow-ash' in the southern States, is also found in New Caledonia; its hard, tough wood is used by the aborigines for making boomerangs. See CUDRANIA.

Moran, PATRICK FRANCIS (1830-1911), born at Leighlinbridge in Ireland on 16 September 1830 and educated at the Irish College in Rome (where his uncle, afterwards Cardinal Cullen, was rector), was ordained priest by special dispensation (being under the canonical age) on 19 March 1853, and for the next 12 years occupied various chairs in the ecclesiastical colleges at Rome, from 1856 to 1866 being vice-rector of the Irish College and professor of Hebrew at Propaganda. During these years he utilized his ready access to the Vatican libraries to make a deep study of Celtic ecclesiastical history, and in 1864 published *Essays on the Origin, Doctrine and Discipline of the Early Irish Church.* In 1866 he returned to Ireland to be his uncle's private secretary, professor of Sacred Scripture at Cloniffe College, and founder of the *Irish Ecclesiastical Record*; on 5 March 1872 he was consecrated bishop of Olba and coadjutor of Ossory, and on 18 August succeeded to that see. On 21 March 1884 he was translated to the see of Sydney, in which he succeeded Archbishop Vaughan (q.v.), and in 1885 was summoned to Rome by Leo XIII —his lifelong friend—apparently with a view of his being made archbishop of Dublin; after it was found advisable to give this position to Dr. Walsh, Dr. Moran was appointed archbishop of Sydney and subsequently was created cardinal. As primate of Australia he presided over plenary councils in 1885, 1895, and 1905, and visited Rome in 1888, 1898, 1902, and 1903—on the last occasion to attend the conclave which elected Pius X. He died in his palace at Manly, New South Wales, on 16 August 1911.

Cardinal Moran's work in Australia was unceasing and of great value. In his diocese he completed the main section of the new cathedral of St. Mary's (an older one had been destroyed by fire), established many orphanages, hospitals, and schools, and is said to have expended a million and a half sterling on Catholic institutions during his term of administration. He also consecrated 14 bishops, ordained nearly 500 priests, and dedicated more than 500 churches—the cathedrals at Ballarat, Bathurst, Bendigo, Goulburn, Hobart, Lismore, Melbourne, and Rockhampton, as well as that at Auckland in New Zealand, were all either consecrated or dedicated by him. Of even more importance was his foundation of two seminaries intended by him to serve the whole of Australia—St. Patrick's College at Manly, near Sydney, on which he spent £70,000, in order to make it the pan-Australian school for the priesthood, and St. Columba's College at Springwood on the Blue Mountains, ultimately intended to train missionaries for the islands of the Pacific. He was one of the ablest educationists then in Australia, and, while as an extremely militant churchman he repeatedly and vigorously attacked the undenominational system of primary education which prevails in Australia —demanding that Catholic schools should be subsidized by the government on their secular results —he also greatly improved Catholic education by persistent superintendence and reform of the schools under his control.

But he was not content with purely ecclesiastical duties. Though militant to the point of aggressiveness when he thought his Church in danger, he was statesman enough to know how to control his militancy when dealing with secular affairs; and his whole-hearted adoption of Australia as his home led him to take part in many public movements outside his professional sphere. Thus he was an ardent advocate of home rule for Ireland (though he had opposed the Land League agitation), a strong sympathizer with the Australian Labour movement—especially during the maritime strike of 1890—and a persistent and judicious supporter of federation. Sir Henry Parkes—who for other reasons was no friend of the cardinal's—said of him in parliament 'The federal cause has no more earnest, no more eloquent, no more powerful advocate;' and his influence did much to secure the decisive vote in its favour, although he himself was an unsuccessful candidate for election to the convention of 1897-8. Every movement, indeed, that could aid in giving Australia a sense of nationhood received his support; he approved of the despatch of Australian troops to the Sudan, and did his best to educate public opinion up to the establishment of Australian military and naval forces on a scale adequate to the needs of local defence.

As a writer, too, he was noteworthy from his youth up. While still in Europe he published (besides the *Essays* mentioned above) a *History of the Catholic Archbishops of Dublin* (1864) and a *Spicilegium Ossoriense* (1874-84), which valuably illustrate Irish church history. His chief Australian publication was the *History of the Catholic Church in Australia* (1896), which, though awkwardly planned with a division by dioceses, has not yet been superseded or matched; but he also poured out a continuous stream of pamphlets on religious, biographical, and sociological subjects, and edited the *Pastoral Letters of Cardinal Cullen.*

E.M.O'B.

Morehead, Boyd Dunlop (1843-1905), born at Sydney in August 1843, and educated at W. T. Cape's school, the Sydney grammar school, and the university of Sydney, after a few years in the employ of the Bank of New South Wales was made an inspector of Queensland stations for the Scottish-Australian Investment Company, of which his father was the Sydney manager. In 1871 he was elected to the Queensland legislative assembly by the pastoral constituency of Mitchell, and at once took his place as the parliamentary jester; nor was he ever regarded very seriously as a politician. From December 1880 to August 1883 he was postmaster-general in McIlwraith's first ministry, and colonial secretary in his second (June-November 1888); then, mainly because McIlwraith was ill and his colleagues all jealous of each other, Morehead took the premiership, and kept his team together for nearly two years until McIlwraith and Griffith formed their famous coalition. His term of office was made notable by the passage in 1889 of the first Queensland payment of members act and of a very advanced mines regulation act, and by the establishment during that year of a 'record' sitting of the assembly—97½ hours, from 3 p.m. on Monday 28 October to 4.15 p.m. on Friday 1 November. In 1893 Morehead refused the offer of the agent-generalship, and in 1896 was nominated to the legislative council (in which he had sat for a short time in 1880); but he took no further active part in politics, and died at Brisbane on 30 October 1905 .

Moresby, John (1830-1922), second son of Sir Fairfax Moresby who in 1850 was commander-in-chief in the Pacific and arranged the transfer of the Pitcairners to Norfolk Island (q.v.), was born on 15 March 1830 and went to sea as a first-class volunteer at the age of 12 (lieutenant, 1851; commander, 1858; captain, 1864; rear-admiral, 1881; vice-admiral, 1888). He saw active service in the Baltic (1854-5) and China (1861), cruised in Japanese waters in 1864, and in 1871 was appointed to H.M.S. *Basilisk* for service on the Australian station. While cruising off the New Guinea coast in 1873, the idea (to use his own words) came to him to go exploring; and by the end of the cruise he had charted 600 miles of previously unsurveyed (and partly unknown) coast-line, investigated about 160 islands which had previously been thought part of the mainland, and hoisted the British flag at Port Moresby. On return to England he published *Discoveries and Surveys in New Guinea* (1876). In 1879-81 he was senior officer at Bermuda, and retired in 1888. A full account of his life will be found in his *Two Admirals,* published in 1909. He died at Fareham in Hampshire on 13 July 1922. Two of his paintings—an oil showing the discovery of Port Moresby, and a water-colour of the hoisting of the British flag on Hayter Island near Samarai—have been presented to the Royal Australian Navy. In 1914 the admiralty paid him the unique compliment of naming after him the destroyer *Moresby*; no other warship has been named after a living man. His name is also appropriately given to the survey-ship which in 1925 was allotted to work along the northern coasts of Australia. See Papua.

W.J.

Morgan, Sir Arthur (1856-1916), born at Warwick in Queensland on 19 September 1856 and educated at the local state school, was from an early age employed in the office of the *Warwick Argus,* a newspaper owned and edited by his father James Morgan, and afterwards by himself. James Morgan sat in the assembly as member for Warwick from 1870 to 1883, and became chairman of committees; in 1884 Arthur Morgan succeeded him in the seat, and in 1891 in the chairmanship. From 1896 to 1898 he was out of parliament, having been made chairman of a royal commission on local government; but in 1899 he regained the Warwick seat and was at once chosen to be speaker—a post which he held until 1903. When in that year the Philp ministry was defeated on its financial proposals and party government seemed to be disorganized, Morgan accepted the leadership of a coalition including Labour members and seceders from the Philp party, and for more than two years discharged an uncongenial and unpopular duty by carrying on the government through one of the most critical eras in the State's history. By January 1906, William Kidston (q.v.) having established his reputation both as treasurer and as party leader sufficiently to take over the premiership, Morgan resigned his seat, retired to the legislative council, and was made its president. In 1908 he was appointed lieutenant-governor of the State, and administered the government in 1909 and 1914-15. He died at Brisbane on 20 September 1916.

Morgan's premiership produced few important acts, but was of great value as training for the Labour members of the coalition, whose inexperienced eagerness was controlled by him with equal sympathy and judgment. (Kt. Bach., 1907.)

Morgan, Sir William (1829-1883), born in 1829 at Willshamstead near Bedford in England, migrated to Adelaide in February 1849, and for the next 20 years devoted himself to mercantile, mining, and pastoral affairs. In 1869 he entered politics, being elected on 6 August to the legislative council, and in 1871 represented South Australia at an intercolonial conference held in Melbourne to deal with tariffs, a customs union, mail contracts, etc. In June 1875 he joined the Boucaut ministry as chief secretary, but resigned in the following March to attend to private business, and publicly intimated that he would not offer himself for re-election in 1877. During his absence from the colony, however, he was again returned at the head of the poll, took his seat in the council, and was by a vote of its members made its leader during its dispute with the Colton ministry of 1876-7. He took office again as chief secretary in the fourth Boucaut ministry (1877-8), and became premier when Boucaut went to the supreme court in September 1878; his ministry, reconstructed in March 1881, was defeated in June, and he retired from politics. In 1883 he visited England, and died at Brighton on 3 November. (K.C.M.G., 1883.)

Morinda, a genus of the family Rubiaceae, largely tropical, chiefly Asiatic. The flowers are usually united by their bases into small heads; calyx short; corolla cylindrical; fruit a compound succulent mass, composed of the individual fruits. *M. citrifolia* (Leichhardt's Tree or Indian Mulberry) has a bitter granulated fruit, of which the natives of northern Queensland are very fond. In India the green fruit is used in curries. The root yields a yellow and the bark a red dye, used by Polynesians, and in India, to colour materials. The wood has a musk-like odour, and a pleasingly wavy grain.

Morphett, Sir John (1809-1892), born in London on 4 May 1809 and trained for a commercial career, in 1835 purchased land in the projected colony of South Australia and on 20 March 1836 left England in the *Cygnet* with a number of officials and government employees. Reaching Kangaroo Island on 11 September, he took the first opportunity of establishing himself as a merchant in the embryo Adelaide, which he helped Colonel Light to lay out. He at once became prominent in public work, joining the committee for the protection of aborigines, founding the mechanics' institute and the first local insurance company, exploring the Fleurieu Peninsula south of Adelaide, and giving sound advice to intending colonists. In 1840 he was made treasurer of the Adelaide corporation. In 1843 he was nominated by the governor to the first legislative council, was renominated in 1851, and was speaker in 1851-5. Under the constitution of 1857 he was elected to the legislative council, was re-elected in 1865, and held the seat until 1873, when he retired from politics. For five months in 1861 he was chief secretary under Thomas Reynolds; he had never been a party politician, and in the former council his chief interests had been council reform, state aid to religion, and anti-transportation, and he joined no other ministry, but in 1865 was chosen president of the council. He was a lover of horses; in 1837 he owned one of the two that constituted the colony's whole stock, and in 1838 entered a horse for the first races held in South Australia, in succeeding years often riding his own entries. In 1844 he helped to found the Royal Agricultural Society of South Australia. From 1873 onwards he lived in retirement, and died at Glenelg on 7 November 1892. (Kt. Bach., 1870.)

Morris, Edward Ellis (1843-1902), born at Madras on 25 December 1843, and educated at Rugby and Lincoln College, Oxford (B.A., 1866; M.A., 1869), after holding assistant-masterships at Radley and Haileybury and a headmastership in Bedfordshire, was in 1875 made headmaster of the Church of England Grammar School at Melbourne. In 1883 he was transferred to the chair of modern languages and literature in the university of Melbourne, and held it till his death. He took great interest in library work, established a library (named after him) at the grammar school, and in 1879 became a trustee of the Melbourne public library, which by increasing to the utmost the technical and Australian sections and by establishing a lending branch he endeavoured to make 'a university for the people.' He was also very active in the formation of societies—not only of a literary nature, for the charity organization society of Melbourne is of his founding. His literary output, which was considerable, included several historical primers, a memoir of his father-in-law George Higinbotham (1895), and *Austral English,* an excellent dictionary of Australian words, phrases, and usages (1898). He died on 2 January 1902, during a visit to England, leaving behind him an unfinished work, *Cook and his Companions,* to which he had devoted several years of hard work.

Morrison, George Ernest (1862-1920), born at Geelong in Victoria on 4 February 1862, and educated at Geelong College (of which his father was principal) and the universities of Melbourne and Edinburgh (M.D., 1887), while still a schoolboy walked from Queenscliff to Adelaide (500 miles), and on another occasion paddled a canoe down the Murray for 1500 miles. Later he shipped as a seaman (but for journalistic purposes) on board a schooner engaged in the kanaka trade between Queensland and the South Sea islands. At the end of 1882 he walked from Normanton on the Gulf of Carpentaria to Geelong (2000 miles), and in 1883 led a pioneer expedition to New Guinea and was speared in the head and abdomen. Visiting England in 1883, he studied at Edinburgh, and practised as a surgeon for three years. Afterwards he travelled in the United States and Jamaica, and then visited Spain (where he acted as medical officer at the Rio Tinto tin-mines), Morocco, and other parts of northern Africa. Returning to Australia, he became resident surgeon at the Ballarat hospital, but in 1894 went to Japan, and, after traversing the islands, crossed to China and commenced his famous journey across that country—up the Yangtze valley and through Burma to Rangoon. In 1895 he published *An Australian in China; being the Narrative of a Quiet Journey across China to Burma.* This book attracted the attention of Moberly Bell, then manager of *The Times,* who engaged Morrison as *Times* correspondent, first in Siam, afterwards in Peking—a post which he held until 1912. In 1896 he journeyed from Bangkok round Tongking to Yunnan City in China, and in 1897 from Stretensk in Siberia to Vladivostok. His services during the 'Boxer' war (when he was reported killed, and had the pleasure of reading in *The Times* a highly eulogistic obituary notice), and through the succeeding troubles and wars in China, were of exceptional value to the British foreign office

as well as to his newspaper. In 1910 he rode from Honan City in central China to Andijan in Russian Turkestan—3750 miles in less than six months. In July 1912 he was appointed political adviser to the president of the Chinese republic, and exerted valuable influence on the foreign policy of the country during the war of 1914-18. In 1919 he revisited England, and died there on 30 May 1920. Morrison was one of the ablest journalists of his time, with an almost uncanny prescience of events in Far Eastern politics, largely due to his personal knowledge not only of the big seaport towns but of every province of China except Tibet. His library, which was a remarkably comprehensive collection of the world's literature connected with China, he sold before his death to a Japanese statesman.

J.V.C.-B.

Mort, THOMAS SUTCLIFFE (1816-1878), born at Bolton in Lancashire on 23 December 1816, was trained for a commercial career in Manchester, and in 1838 reached Sydney, obtaining employment with Aspinall, Brown & Company as a clerk and salesman. In 1841 he helped to form the Hunter River Navigation Company, which later developed into the Australasian United Steam Navigation Company (see SHIPPING). The Aspinall firm collapsed in the financial crisis of 1842, and in 1843 Mort started independently as an auctioneer and wool-broker, and began to experiment in exporting cured animal food to England. This project, however, failed, and it was many years before he revived it. In 1845 he initiated the famous firm of Mort & Company, whose methods enabled the small grower to realize on his wool quickly. In 1849 he promoted the first line of railway in New South Wales—between Parramatta and Sydney—and, when the gold-fever began in 1851, formed the first Australian gold-mining company, the 'Great Nugget Vein Mining Company.' In 1854, recognizing the necessity for a large dock at Sydney, he commenced the excavation of the largest dock in Australia (see MORT'S DOCK).

In 1856 he took up agriculture, and established in the southern coastal district of New South Wales the Bodalla farm (14,000 acres, later increased to 38,000), which had a great influence on the development of Australian dairying. In the early sixties he floated the Peak Downs Copper Mining Company in Queensland and the Waratah Coal Mining Company in Newcastle, and in 1863 enlarged his docking business, excavating at Balmain a dry dock from which, at a later date, was launched the *Governor Blackall,* the largest steamer built in Port Jackson up to that time (see SHIPBUILDING). He also established a shipyard and works for the manufacture of steam engines, railway carriages, and machinery; this developed into the well-known Mort's Dock and Engineering Company. In 1873 he offered his workmen shares in the business, and all the foremen became shareholders. In 1870 he began a series of experiments in freezing and thawing meat with a view to repeating his earlier attempt to send it to England, and in 1875 established a slaughter-house and freezing-works at Lithgow, and ice-works at Darling Harbour. He chartered the first steamer for the frozen-meat trade and invested £80,000 in the venture, squatters contributing £20,000; but the refrigerating machinery broke down during the voyage, and the failure prevented further experiments; he therefore converted his freezing-works into ice-factories. Just as his cherished idea of sending frozen meat abroad was accomplished he died at Bodalla on 9 May 1878.

In June 1883 a statue, executed by Pierce F. Connolly in Florence, was erected to his memory in Macquarie-place, Sydney, and unveiled by the then governor, Lord Loftus.

Mort's Dock, established by T. S. Mort (q.v.) at Balmain near Sydney in 1854, was in 1872 taken over by the Mort's Dock and Engineering Company; in 1889 an area at Johnstone's Bay (now the Jubilee dock) was added; in December 1901 a dockyard was opened at Woolwich on the Parramatta River, and in 1924 an area at Waterview Bay in Balmain was taken over. The business now includes two graving-docks, four floating docks, four slips, and six separate engineering establishments. The original Mort's dock is 640 feet long, with a breadth of 49ft. 6in. on the sill and a depth on the sill of 18 feet at high water and 14 at low water of ordinary spring tides; it is equipped with an intermediate caisson, and can dock two vessels of an aggregate length of 615 feet at the same time. The Woolwich dock is 850 feet long and 75 feet wide at the sill, having a depth on the sill of 26 feet at high water and 22 at low water; the pumping-plant is capable of discharging 4,000,000 gallons of water per hour, emptying the dock in about two hours. At Waterview Bay there are two floating docks, and two at the Jubilee dock; the largest (at the Jubilee dock) is 320 feet long with an entrance breadth of 50 feet at the top, and is capable of lifting vessels up to 1100 tons. Of the slips three are at Balmain, the company's headquarters, and the fourth at Waterview Bay; the largest, at Balmain, has a length over blocks of 270 feet, a breadth of 36 feet, and is equipped to lift vessels up to 1500 tons. The iron-foundry at Balmain contains cupolas capable of melting 20 tons of metal per hour, blowers, loam-mill, core-making machinery, three travelling cranes (one of 30 tons), and two reverberatory furnaces each capable of handling six tons of metal; the brass-foundry has a 4-ton reverberatory furnace installed to meet the requirements of large steamers for manganese and phosphor-bronze propeller-blades; in the blacksmith shop (which contains 50 hearths) the largest steam hammer is capable of handling blooms up to 36 inches in diameter; the lifting equipment includes a 65-ton sheerlegs and a 10-ton cantilever crane with an effective radius of 140 feet.

Morwell. See YALLOURN.

Morwong, an excellent food-fish (*Dactylopagrus morwong*) of the family Cheilodactylidae, which occurs on the coasts of southern New South Wales, Victoria, Tasmania, and New Zealand. It principally frequents off-shore grounds, and considerable numbers are taken by trawlers; before their advent the market supply was very intermittent, as the only specimens captured were by fishermen using hand and long lines in quest of snapper. Although it may attain a length of two feet six inches, the morwong is not regarded by line-fishermen as a first-rate sporting fish. A squid or fish bait is taken readily.

T.C.R.

Mosquitoes, insects of the family Culicidae; about 100 species, classified in 35 genera, have been described from Australia. Their habits, especially that of acting as hosts to

various pernicious disease-germs, make them both obnoxious and highly interesting to mankind.

The classification of the mosquitoes cannot be regarded as settled. The system based on scale-structure has been largely superseded by a classification based on structural differences, and Edwards has placed a large number of Australian species under *Ochlerotatus,* sinking a number of smaller genera. Under the existing scheme two sub-families, Anophelinae and Culicinae, occur in Australia. The former are represented by five species, *Anopheles stigmaticus, A. atratipes, A.* (*Myzomyia*) *annulipes, A.* (*M.*) *amictus,* and *A.* (*M.*) *bancrofti. A. annulipes,* commonly found all over Australia and extending to Papua, is almost certainly the carrier of the parasites of malaria. *A. bancrofti,* widely distributed in northern Australia, may also be a malaria-carrier (see BANCROFT, JOSEPH, NEMATHELMINTHES, PUBLIC HEALTH, and TROPICAL MEDICINE). The other species are rare and probably of little significance.

The Culicinae include the majority of our genera. Of special medical interest are *Culex fatigans,* the intermediate host of *Filaria mansoni,* and *Aedes argenteus* (*Stegomyia fasciata*), which, besides being the carrier of yellow fever in other lands, has been lately proved by J. B. Cleland to be the carrier of dengue. Both these species breed in and round houses. Other annoying species are *Ochlerotatus vigilax, O. occidentalis, Scutomyia notoscripta, Mucidus alternans* (Scotch or Hexham Gray) and *Culex sitiens. Toxorhynchites speciosa,* the handsomest of all Australian mosquitoes, is a non-biter.

Mosquito larvae are the favourite food of several Australian fishes, notably the Blue-eye (*Pseudomugil signifer*) and Freshwater Sunfish (*Melanotaenia nigrans*) among the Atherinidae and the Carp-gudgeon (*Carassiops compressus*) and Fire-tailed Gudgeon (*C. galii*) among the gobies. Where these natural enemies are not available, the pest may be minimized by covering the pools in which the larvae breed with a thin film of kerosene (which blocks their spiracles) or by dosing the pools with a very small amount, sometimes as little as one part in a million, of copper sulphate, which destroys their food. The surest preventive, of course, is to fill up the pools and do away with all patches of stagnant water.

R.J.T.

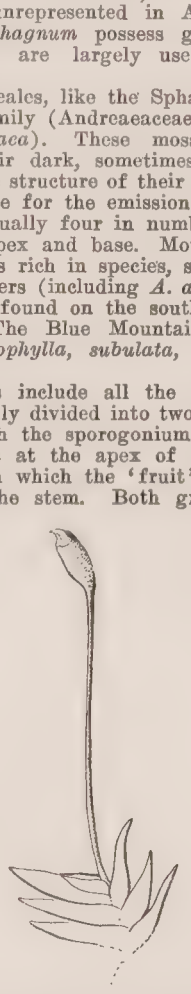
Mosses. The moss-flora of Australia is remarkably varied in its range, and consists of many hundreds of species belonging to nearly 200 genera.

Life-history.—Mosses (Musci) and liverworts, q.v. (Hepaticae) are cellular cryptogams, and are known to science as Bryophyta, as distinct from the Pteridophyta (ferns), which are vascular cryptogams. Mosses are characterized, like the ferns, by alternation of generations; but, unlike the ferns, the plant itself bears the male and female flowers, sometimes at the root, more generally in the leaf-axils, or at the apex of stem or branch. The spore develops into a thread-like growth (protonema), which produces plant-buds. From the female flower (archegonium) arises, by fertilization, a special organ (sporogonium), consisting of a spore-capsule (theca), which is either sessile, or raised on a shorter or longer stalk (seta). In growing, the sporogonium bursts the archegonium and carries the upper part with it as a veil (calyptra) which is often, as in the case of *Dawsonia polytrichoides,* a beautiful and distinctive object. The capsule is either entirely closed, as in the cleistocarpous mosses, or furnished with a lid (operculum). The operculate mosses cast their lids, when ripe, to allow of the emission of their spores, whereas the cleistocarps burst irregularly. The mouth of the operculate capsules is often furnished with one or more series of teeth (peristome), which are regular in number (4, 8, 16, 32, 64), richly coloured and most variously constructed. The calyptra, operculum, capsule, and seta are most varied in their character; the leaf-structure of mosses shows an even more bewildering variation. The spores usually grow from a columella within the capsule.

Classification.—The modern classification of mosses is not based upon any one character, though the fructification is a factor of much importance. Three sub-classes are recognized: (1) Sphagnales (bog-mosses), (2) Andreaeales (alpine or sub-alpine rock-mosses), and (3) Bryales (mosses proper). The Sphagnales consist of one family only, Sphagnaceae, represented by one genus, *Sphagnum,* with some 30 recorded species in Australia. Of the ten sections into which *Sphagnum* is divided, six (notably *Acutifolia*) are unrepresented in Australia. The species of *Sphagnum* possess great absorbent qualities, and are largely used for surgical dressings.

The Andreaeales, like the Sphagnales, consist of a single family (Andreaeaceae) with but one genus (*Andreaea*). These mosses are easily known by their dark, sometimes nearly black, colour, and the structure of their capsules, which split lengthwise for the emission of the spores, the valves (usually four in number) remaining attached at apex and base. Mount Wellington in Tasmania is rich in species, several of them European; others (including *A. australis* and *A. asperula*) are found on the southern ranges of Australia. The Blue Mountains provide *A. tenera, amblyophylla, subulata,* and *subulatissima.*

The Bryales include all the mosses proper. They are usually divided into two groups: Acrocarpi, in which the sporogonium (the so-called 'fruit') grows at the apex of the plant, and Pleurocarpi, in which the 'fruit' grows out of the side of the stem. Both groups are well



Fissidens rigidulus.

represented. The Acrocarpi vary from the tiniest ground-mosses, like *Ephemerum* or *Acaulon,* up to the majestic *Dawsonia superba,* 12-24 inches

in height. A number of the smaller acrocarps are cleistocarpous, and these are sometimes made a separate sub-group; but on the ground of their general structure it is better to regard them as primitive members of the various acrocarpous families. Dr. F. V. Brotherus enumerates 21 families, of which all, except four or five, occur in Australia. Of these the most richly represented are the Dicranaceae, Fissidentaceae, Pottiaceae, Orthotrichaceae, Funariaceae, Bryaceae, and Bartramiaceae. The Dawsoniaceae in addi-

Hypnum crinitum.

tion to their remarkable structure are almost exclusively Australasian. In the group Pleurocarpi we have a wide range of genera and species, of which many, flourishing in the 'rain-forests' of north-eastern Queensland, are tropical in char-

Hypnodendron spininervium.

acter. The scientific order of the families represented is as follows:—Erpodiaceae, Hedwigiaceae, Cryphaceae, Leucodontaceae, Cryptopodiaceae, Lepyrodontaceae, Echinodiaceae, Ptychomniaceae, Neckeraceae, Lembophyllaceae, Entodontaceae, Fabroniaceae, Hookeriaceae, Hypopterygiaceae, Helicophyllaceae, Rhacopilaceae, Leskeaceae, Hypnaceae, Sematophyllaceae, Brachytheciaceae, Hypnodendraceae.

See W. J. Hooker's *Musci Exotici* (1818-20); J. D. Hooker's *Flora Antarctica* (1844-7), *Flora Tasmaniae* (1860), in which the mosses are described by W. Wilson; Warnstorf's *Sphagnologia Universalis* (1911); Paris's *Index Bryologicus* (1893-8) with Supplement (1900); and the works of the following Australian bryologists published in various scientific journals—F. von Mueller, C. Mueller (Victoria), W. A. Weymouth, L. Rodway (Tasmania), F. M. Bailey (Queensland), R. Tate and J. Stirling (South Australia), W. W. Watts, and T. Whitelegge (New South Wales).

W.W.W.

Mother Carey's Chicken. See PETRELS.

Moths. The classification of moths is dealt with under LEPIDOPTERA. This article treats only of their economic importance.

The most serious pest of fruit-trees in Australia is undoubtedly the introduced Codling-moth (*Carpocapsa pomonella*), which, if allowed to breed unchecked, may destroy every apple, pear, and quince in an orchard, and is also a serious pest of the plum, peach, and other stone-fruits. On the mainland it is at least double-brooded, and three broods have been reported. In Tasmania it is single-brooded, and this is one reason why apple-culture is specially successful there; another is that prohibition of the sale of infected fruit is rigidly enforced, so that the pest can be kept within reasonable bounds by proper treatment, and especially by the use of arsenate of lead just after the petals have fallen. It has been estimated that the codling-moth destroys 10 per cent of the apples grown, and, but for the remedial measures taken by orchardists, would take 40 per cent.

In parts of eastern Australia stone-fruits are attacked by larvae of *Conogethes punctiferalis* (Peach-moth), which also bore into maize-cobs after the manner of *Heliothis armiger*, mentioned below. The moth itself is bright yellow, with numerous small black spots.

A serious enemy of the grape in New South Wales and Victoria is *Agarista glycine* (Vine-moth) whose many variegated larvae (growing to a length of 1½ inches) often defoliate vines. The moth is black, prettily marked with yellow and orange, and has several broods in a year; it also attacks the Virginia creeper and other vines, and fuchsias. The Hawk-moth (*Chaerocampa celerio*) also attacks grape-vines throughout Australia. The larvae of this beautiful moth grow to a length of four inches, and are so numerous at times that the ground beneath them is covered with their dung-pellets; fortunately they are kept in check by natural enemies (*Tachinia* flies and ichneumon-wasps).

Among the most curious of fruit-attacking insects are the orange piercing moths (Ophiderinae) whose proboscis is acutely tipped and barbed with a hard boring apparatus, enabling them to pierce the skin of oranges, bananas, mangoes, and grapes, which then fall prematurely in a damaged condition. Three species (*Othreis fullonica, Macnas salaminia,* and *Argadesa materna*) are widely distributed not only in Australia, but over a wide range of the Indo-Malayan region.

The Emperor Moth (*Antheraea eucalypti*) attacks gum-trees and pepper-trees, as well as apple and other fruit-trees. Its large caterpillar (green, with blue-tipped processes) consumes several times its own weight of food in a day, but shares with the hawk-moth larva several efficient natural enemies; a case is on record from Tasmania in which nearly 600 small ichneumon-wasps were reared from a single emperor-moth larva—which yet had sufficient energy to form a cocoon.

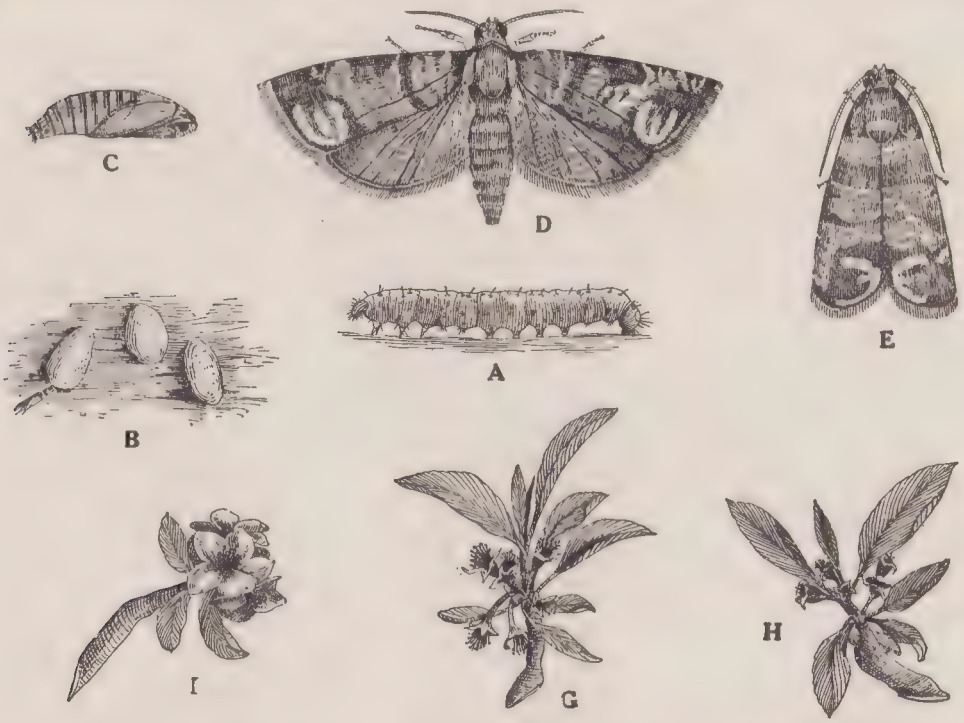
The Cherry-tree Borer (*Cryptophaga unipunctata*) is a native moth whose larva originally fed on species of *Acacia* and *Banksia*, but has transferred his attentions to cherry, apple, pear,

quince, nut, hawthorn, willow, elm, and other useful trees; gum may often be seen oozing from the holes he bores. A widely distributed native moth that has become a serious pest is *Cacaecia postvittana*, of which the adult is pale brown, with variable markings; the larva is a pale, dingy green, and, when feeding, joins two leaves (or a leaf and a fruit) for a hiding-place. It disfigures apples, stone and citrus fruits, grape-vines, currants, walnuts, tomatoes, asparagus, beans and peas, besides such garden-plants as the dahlia and chrysanthemum. It is also injurious to stored apples, in which eggs or young larvae may have been allowed to remain. Case-moths (Psychidae) abound in all timbered parts of Australia, and are sometimes so numerous on apple-trees that poison-sprays must be used. The larvae devour leaves and bark, and when approaching maturity spin round a twig a silken girdle which kills it. The females are wingless, and never leave the cases. Those of a Queensland species of *Metura* construct bags almost a foot long. Few birds will eat them, but they have many parasites. The mating-habits of some species are curious.

In Tasmania and eastern Victoria the Underground Grass-grub (*Oncoptera intricata*) sometimes occurs in such numbers that thousands of acres are stripped of all fodder-plants. The grub constructs, and lives by day in, a cylindrical burrow a foot or so in length, lined with silk; it comes out at night to feed. The rarer female seldom flies. The males fly actively at night; it is not unusual to see a mass of males, the size of a cricket-ball, struggling round one female. Among its many insect enemies the most useful is a small ant (*Pheidole tasmaniensis*), the workers of which collect thousands of the eggs and store them in small pockets in their nests. As the larvae hatch, they are eaten, and the empty shells are taken outside the nests.

Many large and beautiful 'timber-moths' of the genera *Charagia, Hepialus, Oenetus, Leto,* and the more soberly coloured *Zeuzera,* have larvae which bore into the solid wood of forest trees. Only one (*Charagia lignivora*) has been recorded as attacking apple-trees in Victoria, South Australia, and Tasmania. The male is green, with white markings on the front-wings; in the female the white is replaced by reddish markings, the hind-wings being also reddish.

One of the most destructive of the 'hairy caterpillars' is the larva of *Teia anartoides,* which skeletonizes the leaves of the apple and pear, and nibbles patches of skin from the fruit. The male moth is yellow-and-brown, with variegated markings; the wingless female is uniformly brown. A white moth (*Porthesia hololeuca*) has a hairy larva, smaller and more variegated than that of *Teia,* which also nibbles apples as well as the bark of young shoots. A larger 'woolly-bear' larva—without any special bundles—feeds on grasses and many garden-plants; the moth (*Artices glatygnii*) is white with brown markings, reddish beneath. The larvae of species of *Teara* (*interrupta, contraria,* and others) live in communities in silken bags or 'tents' which range up to 10 by 8 in., and weigh, with their contents, several pounds. By day they remain in the bags, among cast skins and excreta, coming out to feed by night, always marching in single file, each touching the one in front. As they grow older the hairs drop out; consequently cattle do not like feeding beneath trees on which bags are abundant, and



(A) Larva of Codling-moth (*Carpocapsa pomonella*); (B) cocoons and pupa-case; (C) pupa (D) moth; (E) characteristic attitude of moth; (F) blossom, too early for spraying; (G) correct stage for spraying; (H) too late for spraying. (A approximately twice, B three-quarters, C, D, E three times natural size.)

some actually die from inflamed mouths. Stockmen cutting such trees for feed suffer severe irritation due to the penetration of the hairs into exposed parts. The females have a dense tuft of hairs at the tip of the abdomen, used to cover up the eggs. They are especially destructive to myall and yarran.

Pinara nana, a pale yellowish-brown moth, has curious woolly white larvae, often seen on apple and apricot trees, where, pressed closely to the twigs by day, they resemble clumps of lichen. At night they eat the bark, leaves, and fruit and, when fully grown, spin a flimsy white cocoon. Another species spins a large green cocoon. All the species may be found on eucalyptus trees. Hairy caterpillars are subject to parasites, but seem to be avoided by birds—except by cuckoos, whose stomachs are frequently found crammed with their remains.

Cutworms are night-feeding larvae of noctuid moths, which remain underground by day; they cut off plants level with the ground, and by their attacks on vegetable and grain-producing plants probably do more damage than all other insects combined. In the Tamworth district of New South Wales a crop of 1000 acres of English barley, which afterwards yielded between 30 and 40 bushels per acre, was attacked by millions of cutworms, and was saved by an expenditure of £97.

The Bugong Moth (*Euxoa infusa*, formerly known as *Agrotis spina*) in some years appears in countless numbers, delaying trains in tunnels (because the crushed bodies make the rails greasy), sometimes obscuring the lantern of a lighthouse, and annoying suburban householders by an abnormal destruction of gas-mantles. The larvae destroy grass and cereals over extensive areas. The aborigines used to make periodical trips to the Australian Alps to gorge on this delicacy. Here in rock crevices and caves they occur in masses (hence the name Bugong—or Bogong—Mountains).

Another species (*Euxoa radians*, also known as *Agrostis munda*) is a serious grape-vine pest which, before bait-laying and spraying were adopted, did immense damage in Western Australia by devouring the young bark, buds, and leaves. Skins of potato-plants and hop-vines are partly eaten through and die; swedes and turnips are gnawed, and many garden-plants (especially carnations) attacked. The larva, of a dingy earth-colour, is not easily noticed, so that the damage it commits is often attributed to other causes.

The striped larvae of *Mamestra ewingi*, found in Tasmania, attack cereals (also potatoes), nipping off the heads so that the crop seems to have been stripped. These caterpillars march in armies in one general direction. In 1919 this species and the bugong ravaged many acres of wheat in South Australia in early spring, the ground being left bare. Like most noctuids, both are cannibalistic when green food is deficient; if the available crop has been destroyed before they are full-fed, they devour each other, so that the second brood is generally less destructive than the first. *M. composita* is the moth whose larva is often seen in tomatoes, which it destroys in the same way as the larva of the maize-moth. The introduced *Leucania unipunctata* and *Spodoptera exempta* occasionally appear in masses. The silvery *Phytoraelia argentifera*, with its ally *P. chalcytes*, are serious enemies to tobacco-plants, beans, peas, and especially potatoes; the green larvae, in appearance almost like looper caterpillars, feed day and night, swarming over the plants in countless numbers. Fortunately they are attacked by bacteria which in some years almost exterminate them, and are further subject to insect-parasites.

Second only to the codling-moth among introduced pests is the Maize-moth (*Heliothis armiger*), the notorious cotton-pest of America. Here its striped larva bores into maize-cobs, pea-pods, tomatoes, apples, and other fruits, and few cultivated plants are free from it. Against 'army worms' poison-baits and sprays are sometimes used. An effective poison is made by mixing a small handful of paris green with a pound of dry bran; this is moistened when required for use and a pinch of salt added to each little heap which is laid among the plants liable to be attacked. A plan commonly adopted is to plough a furrow across the line of their march, and at intervals dig pits about 3 feet deep therein. The larvae seldom crawl beyond, but proceed along the furrow into one of the pits, where from their cannibal habits they are soon destroyed. In potato-crops special sled-like crushers have also been used; these are drawn along a furrow by a horse, and combine the destruction of caterpillars with the 'hilling' of the rows.

Looper caterpillars (Geometridae), represented in Australia by hundreds of species, have, fortunately, little taste for garden-plants, though many eat fodder-plants. Thus *Lophodes sinistraria* attacks the apple, apricot, and runner-bean, and *Phrissogonus pyretodes* bores shot-holes in apples and cherries.

In Norfolk Island the sweet-potato crop is, in some years, almost destroyed by the larvae of the small Convolvulus-moth (*Bedellia somnulentella*). On convolvulus plants this moth bores between the skins of the leaves, covering them with spider-like webbing.

Tree-lucerne is commonly attacked by the beautifully marked *Mecyna polygonalis*, a comparatively recent introduction. The dried-fruit moths, *Ephestia cahiritella* and *Plodia interpunctella*, are to be found in most grocers' shops throughout Australia; currants, dates, dried figs, apricots, etc., are seldom free from them, and nuts are also attacked. The Mill-moth (*Ephestia kuehniella*) attacks all kinds of meal. The best antidote so far appears to be the application of heat. The small *Lita solanella* attacks growing potatoes and tomatoes, and often stored potatoes, the grub entering and destroying the eyes. Tobacco-leaves are also reduced in value by its depredations. The Cabbage-moth (*Plutella cruciferarum*), as well as *Hellula undalis*, attacks cabbages, cauliflowers, turnips, radishes, and other crucifers, riddling the leaves and covering the heart of the plant with webbing and excrement.

Tinea granella, *Sitotroga cerealella*, and *Pyralis farinalis* (grain-moths) are three introduced pests that destroy wheat and maize, especially frequenting the lower parts of wheat-stacks.

The Greater (*Galleria melonella*) and the Lesser (*Achroea grisella*) Bee-moth are now widely distributed throughout Australia. Owing, however, to the improvements in modern hives, they are comparatively easy to control. *Achroea* has been noticed in wasp-nests on the Richmond River.

The chief friends of the agriculturist are birds, many of which feed on insect pests. Thus the ibis destroys cutworms; magpies, woodswallows, and even cockatoos are known to have kept down grasshoppers. The indiscriminate

Photo by S. W. Jackson.

Mound built by Brush Turkey (*Alectura lathami*).

Photo by C. H. H. Jerrard.

Brush Turkey on summit of nest-mound.

Drawn by Neville W. Cayley.

Scrub Fowl (*Megapodius reinwardt*)

Photo. by H. A. Purnell.

Mound built by Mallee Hen (*Leipoa ocellata*), opened to show how the bird places its eggs

use of poison-baits for rabbits tends, unfortunately, to destroy these farmers' friends.

Useful Moths.—Certain moths should be protected as useful destroyers of scale-insects. Thus *Batracheda sparsella* may be seen among masses of *Aspidiotus, Eriococcus,* and *Lecanium,* which they largely destroy. The larger *Thalpochares* species (*T. coccophaga* and *T. pulvinariae*) destroy immense numbers of scale-insects, and construct silken cases to which are attached the external parts of their victims, and under cover of which they move protected from birds.

A.M.L.

Moulton, JAMES EGAN (1841-1909), born at North Shields in Northumberland on 14 January 1841 and educated at Wesley's school at Kingswood near Bath, was apprenticed to his uncle, a Derbyshire chemist, and became organist at the local chapel and a leader among the supporters of foreign missions. In 1862 he was accepted by the Wesleyan conference as a candidate for mission work, and was allotted first to China, then to Fiji; in June 1863 he reached Sydney on the way to his station, but was intercepted and appointed temporarily to the recently established school at Newington near Parramatta (see SCHOOLS). In 1865, when preparing to resume his voyage to Fiji, he was appointed to the Tonga mission, and reached Nukualofa on 30 May. With this mission he was associated for 41 years, 20 of which he spent in Tonga. In 1866 he founded Tubou College, at once a school, a seminary for ministers, and a training institution for government officials. His introduction of choral singing into this college was hampered by the fact that the tonic sol-fa notation included most of the 'swear-words' in the Tongan language, so that he had to invent a new notation. He also prepared a Tongan grammar, and in 1876 was asked to undertake a new translation of the Bible. That of the New Testament he accomplished during a visit to England in 1877-80. He used the original Greek text as his basis, and thus produced a translation more akin to the Revised than to the Authorized version. On his return he found that a fellow-missionary, Shirley Baker, had mismanaged the mission and resigned his post to become premier of Tonga. In 1885 Baker induced the king to establish a Free Church and a government college with special privileges, and to put pressure on all his subjects to abandon the Wesleyan for the Free Church. The quarrel ended in definite and vehement persecution, the disbandment and looting of Tubou College, and the exile of the remaining Wesleyans to Fiji. The British authorities then interfered, peace was nominally restored, and the college was reopened. In 1888, to remove the last vestige of friction between the mission and the king, Moulton handed over his post to George Brown (q.v.) and returned to Sydney, where in 1893 (after a visit to England) he was made president of Newington College—transferred to the Sydney suburb of Stanmore in 1880—and president of the Methodist conference of New South Wales. From 1895 to 1906 he was also chairman of the Tonga district (no longer a mission), and in 1902 completed an exceptionally valuable translation of the whole Bible. His presidency of Newington College (1893-9) fell in years of great difficulty. The financial disasters of 1892 were a heavy blow to Newington and to other schools; but his courage was unquenchable; valuable additions to the school equipment still remain as his memorial. In 1906 he retired from active work, and died at Lindfield near Sydney on 9 May 1909. See his son's *Moulton of Tonga*; and for sidelights on the Baker episode Basil Thomson's *Diversions of a Prime Minister* (London, 1894); and *George Brown; an Autobiography* (London, 1909).

A younger brother, JOHN FLETCHER MOULTON, after a successful career at the bar was in 1906 made a lord justice of appeal and in 1912 raised to the peerage as Baron Moulton of Bank and made a lord of appeal in ordinary. His scientific acquirements were of exceptionally wide range. He was a fellow of the Royal Society and of the Royal Astronomical Society, a president of the Institute of Gas Engineers and of that of Chemical Manufacturers, and during the war of 1914-18 was director-general of explosives in the ministry of munitions. Another brother, WILLIAM FIDDIAN MOULTON, was the first headmaster of the Leys school at Cambridge, and in 1870-81 one of the revisers of the New Testament; and William's son, JAMES HOPE MOULTON, was a learned Egyptologist and an authority on Zoroastrianism.

J.C.

Mound-birds, birds of the family Megapodiidae and order Galliformes (fowls and game birds). Megapodes are peculiar to the Australian region, occurring in Australia, the Pacific islands as far east as Samoa, and the Malay Archipelago west to Lombok, Celebes, and the Philippines. One species, closely allied to one in the Moluccas, is found in a wild state in the Nicobar Islands in the Indian Ocean; it was almost certainly introduced there by the Malays, who frequently keep these birds in captivity. Three species occur in Australia, the scrub hen, mallee hen, and brush turkey.

Megapodes differ from all other birds, and resemble reptiles, in the method by which their eggs are hatched. These are deposited in mounds of earth, sand, and vegetable matter, and hatched by the heat of the sun—more or less aided by heat due to decomposition of the vegetable matter in the mounds. Though the three Australian species differ somewhat in their habits, the main features of their behaviour in regard to the construction and care of their incubating-mounds appear to be the same. The mound is constructed largely or entirely by the male bird, who begins to scratch up material some months before the breeding-season. The first season's mound is a comparatively small heap, but as it is added to year after year it may in time assume very large dimensions. Each female probably lays from 9 to 15 eggs in a season, at intervals of about three days. Sometimes three or four females lay in the same mound, so that it may contain over 40 eggs. The female deposits her egg in a hollow which she scratches out in the mound. The eggs, which resemble those of the domestic fowl, but have very thin shells, are very large in proportion to the size of the bird. As soon as an egg has been laid, the male places it in an upright position by pressing material of the mound round it with his bill or feet. The smaller end of the egg is invariably placed downwards, and the eggs are often arranged in irregular circles of about six or eight, those first laid forming the lowest ring with other rings above, but the eggs in the higher rings are never vertically above those in the lower levels. Incubation apparently lasts for about two months, but varies considerably according to the temperature and humidity of the mound.

While incubation is in progress the birds are never far from the mound, and constantly work at it, opening it up to admit sunshine or moisture as required or banking it up in unfavourable weather. By these means a temperature of about 95° F. is maintained in the interior of the mound. By the time the chick is ready to emerge from the egg, the shell has become very fragile and easily breaks. The chick gradually scratches its way to the surface, possibly in some cases assisted by the parents, but apparently it usually remains for some hours in the mound. Though the body of the newly-hatched chick is covered with down, the quill-feathers of the wings are already large, and it is capable of flight almost immediately after it reaches the surface. Its legs also are strong, and it at once starts to scratch for food and lead an independent existence, the care of the parents being entirely devoted to the incubator.

The Scrub Hen, or Scrub Fowl (*Megapodius reinwardt*), inhabits the tropical scrubs of the coastal districts of northern Australia, from the Kimberley district of Western Australia to the Byfield district on Keppel Bay in Queensland. It occurs also in the Aru Islands and New Guinea. The back and wings are olive-brown, the neck gray and the under-parts and crown of the head fuscous. The feathers on the crown are elongated to form a sort of crest. The bill is reddish-brown and the legs orange-red. The scrub hen is the smallest of the three Australian megapodes, measuring from 14 to 18 inches in length, but it forms the largest mounds. These are often 10 feet high and 70 feet in circumference, and frequently much larger; a specially large one has been estimated to contain 297 cubic yards of material weighing approximately 300 tons. They are composed mainly of soil and sand, and when old mounds have become consolidated, and trees have grown upon them, it is often difficult to believe that they are the work of birds and not natural hillocks. The breeding-habits of this species are not so well known as are those of its congeners, but it would appear that the eggs, which are buff-pink in colour, are deposited irregularly in the mounds at the ends of tunnels scratched out by the females and afterwards filled up with vegetable debris. Occasionally single eggs are placed in holes in the ground, made by the birds when searching for food in accumulations of leaf-mould.

The scrub hen is almost completely terrestrial, generally trusting to its legs to escape from danger, though occasionally it will fly in laboured fashion into a low branch of a tree. It is a noisy bird, uttering loud harsh calls, especially at night. Its food consists almost entirely of insects, centipedes, worms, etc. obtained by scratching among the debris on the ground in the scrubs.

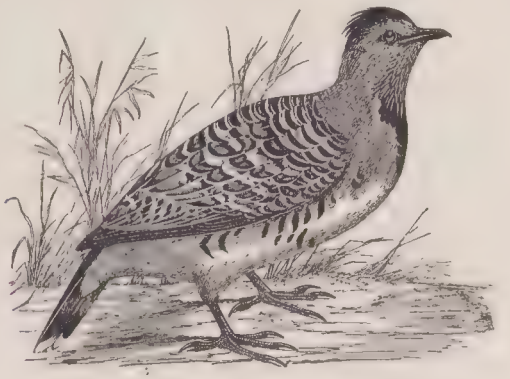
The Brush Turkey or Scrub Turkey (*Alectura lathami*) inhabits the scrubs of eastern Australia from Cape York to the Illawarra district in southern New South Wales. It occurs not only in the tropical scrubs and subtropical brushes of the coastal districts, but also in the softwood scrubs of central Queensland and the brigalow and belar scrubs of western Queensland and north-eastern New South Wales. The brush turkey is much larger than the scrub hen, measuring about 24 inches in length; its plumage is dull black, the feathers on the under-parts being edged with white; the head and neck are devoid of feathers, but are studded with short dark hairs; the skin of these parts is red, and the male has large wattles of bright yellow on the front of the neck; in the female these are rudimentary or absent. Birds from northern Queensland have the lower neck and wattles purplish-white.

The mound of this species is comparatively low, usually only from 2 to 4 feet high with a circumference of about 35 feet. It is composed mainly of leaf-mould, sometimes with a layer of sticks and twigs on the surface. In

Brush Turkey (*length* 24 *in.*).

forming it the birds bring together all the surface debris from a large area surrounding it, scratching the material backwards sometimes for a distance of over 100 yards. The eggs are pure white, but become stained with the earth of the mound. The mounds are generally constructed in shady localities in the scrub, and the heat of the mound is due to the decay of the moist vegetable material, the amount of moisture being carefully regulated by the birds.

Brush turkeys remain on the ground during the day, but roost in trees at night, and also fly up into the trees with a heavy laboured flight when disturbed. Their food consists of fruits and berries, as well as insects, and in many districts they feed largely on the fruits of prickly pear. In consequence they are often shot in Queensland because they are accused of spreading this pest, but experiments with captive birds have shown that the seeds are so much crushed in the powerful gizzard that few, if any, of them are capable of germinating when voided by the birds. The call of this species is a raucous croak and in the breeding-season the male utters a loud 'oom.'



Mallee Hen (*length* 24 *in.*).

The Mallee Hen, Mallee Fowl, or Native Pheasant (*Leipoa ocellata*) inhabits the inland districts of southern Australia (particularly the

mallee and other dry-land scrubs), but occurs also in the coastal forest regions of the south-western corner of Western Australia. It extends as far north as Shark Bay and the Gascoyne district in that State and thence through South Australia to the Broken Hill district of New South Wales, and the Wimmera district of Victoria. It is commonly known by its aboriginal names, 'lowan' in Victoria, 'gnow' in Western Australia. Owing to the clearing of the mallee country for wheat-growing and the destruction of the birds by foxes and sportsmen, mallee hens have now become rare or extinct in many localities where they were formerly plentiful. Some have recently been liberated on Kangaroo Island, South Australia, in the hope that they may survive there when exterminated on the mainland.

The mallee hen is about 24 inches in length and its plumage above is mottled with rufous, brown, and white; there is a black patch on the breast in the male, and the under-parts are dull white. The feathers of the crown, which are fuscous, are elongated to form a sort of crest. The bill is black, the legs bluish-gray. The mound is comparatively low, 2 to 4 feet in height and about 30 to 40 feet in circumference; it is mainly composed of sand but contains in the centre a bed of leaves and other vegetable debris about 8 inches thick. The pale pinkish-buff eggs are placed near together in this bed from which the overlying sand is scratched off in sunny weather and replaced at night or in dull weather, the heat being mainly derived from the sun.

The food of this species consists of insects, seeds, berries, and the tender shoots of plants, and it can subsist without water. It is almost completely terrestrial. Its call is a loud, mournful cooing, uttered with the head between the legs, the back of the head almost touching the ground.

W.B.A.

Mountain Bracken. See FERNS.

Mountain Celery. See ACIPHYLLA.

Mountain Daisy. See CELMISIA.

Mountain Hickory. See ACACIA.

Mountain Moss. See LYCOPODIALES.

Mount Morgan, a hill (originally 1267 feet high) in the Dee Ranges of Queensland, 20 miles SSW. of Rockhampton and 10 miles S. of the tropic of Capricorn. Charles and William Archer, on their way from Eidsvold to Gracemere in 1853, passed close to the foot of it, but for nearly three decades longer it was only an insignificant hill in a tangle of peaks and ridges; the nature of its surface, however, was noted, and it was named 'Ironstone Mountain.' In 1870 John Gordon selected 640 acres of Calliungal (No. 2) run, and his western boundary-fence crossed the summit of the mount; in 1878 he transferred the selection to his son Donald, who acquired a freehold title to the block. In 1882 Donald's brother Alexander, who was working for the brothers Morgan at the Galawa mine on the Cawarral goldfield, offered to take his employers to a silver (some say 'copper') 'show' on Calliungal run, and in July Thomas and Edwin Morgan went with him down the Dee River, but failed to find what they were looking for, and on their way back camped, storm-bound, in a hut on Gordon's selection.

Conflicting stories are told regarding Gordon's knowledge of the value of his property. The facts seem to be that, though he suspected the mountain to be auriferous (since alluvial gold had been found all round its foot), he was unaware that gold might occur in ironstone, and had not troubled hitherto to verify his suspicions. When the Morgans arrived, however, he had just arranged to send a drayload of stone from the mountain for a trial crushing. Edwin Morgan, on the other hand, claims that he suggested prospecting round the hut where they camped, and he and 'Sandy' Gordon took samples of the surface stone from the top of the mountain. The brothers then sent Gordon away, and brought a third brother (Frederick) up to their find; it was renamed 'Mount Morgan,' and as much as they could take up of the ground outside Gordon's freehold was pegged out. To raise capital, a half-share in the mine was sold to Thomas Skarratt Hall, William Knox D'Arcy, and William Pattison. This syndicate purchased Gordon's freehold for £640 and erected at the foot of the mountain a battery which recovered only about one-third of the gold in the ore. After trying and rejecting pan amalgamation, the Plattner process, and the Newbery-Vautin process, a local adaptation of the barrel process of chlorination was found successful.

Meanwhile in 1886 the syndicate, which had won 59,024 oz. of gold from the mine, became a limited liability company with a nominal capital of £1,000,000. By this time the Morgans had sold their interest, and several others, including Walter Russell Hall, had bought in.

In 1887 were completed the 'Lower Works,' capable of treating 500 tons of ore per week. In 1888 a second chlorination plant (the 'Top Works'), with a capacity of 1000 tons per week, was erected on the hillside nearer the mine; 880,904 tons of ore were treated in these plants. In both, the crushed and roasted ore was charged into revolving barrels with water, sulphuric acid, and bleaching powder, the barrels were revolved for several hours, and were then discharged into vats from which the gold chloride was washed, to be precipitated on charcoal. This process was slow and expensive, and in 1892 the Hall-Richard process was introduced—the roasted ore being placed in open vats, wetted down, and treated by running on a solution of chlorine in water, which dissolved the gold and carried it to the charcoal filters. The chlorine for this process was generated from salt, pyrolusite, and sulphuric acid made at the mine. Until 1891, when stoping commenced on a very small scale, the ore mined came from open quarries on the summit of the mountain. Development work, however, showed large quantities of low-grade oxidized ore, and of heavy sulphide ore, which existing plants were not able to treat economically; so a new plant was designed to treat low-grade oxidized ores, and was completed in 1898. The process involved crushing, drying, grinding in ball-mills, roasting in revolving furnaces, cooling and leaching in open vats; a full description is given in the *Transactions* of the Australian Institute of Mining Engineers (xv 363). These 'West Works,' which had a capacity of 400 tons per day, ran until 1910 and treated in all 1,500,814 tons of ore.

To treat the sulphide ore, the 'Mundic Works' were completed in 1901. The furnace adopted (partly reverberatory and partly shaft-furnace) was economical in operation, of large output, and gave a dead roasted calcine suitable for leaching. This plant continued in operation until 1912, and put through 1,278,887 tons of ore. The treatment was similar to that fol-

lowed for low-grade oxidized ores, except that the type of roaster was different, and the calcine was given a preliminary acid leach to extract copper before running on the chlorine solution.

The solutions from both works passed over charcoal filters on which the gold was precipitated; this charcoal was burnt off at intervals, and the ash smelted, the rich slag product being sent away for treatment. When copper ore was discovered in the mine in 1902, a circular water-jacket furnace was obtained, as much to treat the accumulated gold slag as to smelt the copper ore; but exploratory drives and diamond drills soon showed the size of the copper orebody, and in 1906 the first furnace of a large smelting-plant was blown in.

Until 1904 all underground ore came from square-set stopes. In that year a flat-back-chamber method of stoping was introduced in the copper body, and followed until 1908, when two falls of ground that killed 12 men caused the resumption of square-set stoping. All the ore that could be reached by the cheaper method of quarrying has been so obtained, and in 1903 steam shovels were introduced to remove overburden. These ceased digging in 1912, but the open cut is now over 400ft. below the original summit, and covers an extent of 15 acres.

In 1912 it was decided that it would be more profitable to give up chlorination, concentrate the siliceous ore, and smelt the concentrate with the more pyritic ore. This entailed the reconstruction of the whole works, and the plant then erected (which commenced to treat ore in 1914) was in operation until 1925. In this plant the ore was separated into concentrating and smelting ore at the main shaft headgear; the concentrating ore was carried on conveyors to the breakers, and thence to the 800-ton mill, whence the concentrates passed to Edwards furnaces, and from them to the Dwight-Lloyd roasters. One of the three water-jacket furnaces (336in. x 56in.) was in operation at a time, and was fed with mine ore, D.L. sinter, limestone flux, coal and coke, brought to the furnace in electric trains. Baralaba semi-anthracite coal was being used in place of part of the coke charge. The matte was converted in basic-lined converter vessels, and the blister produced was shipped to Port Kembla for refining.

In September 1925 this plant was definitely closed down, operations having been carried on at a loss for some years past. In 39 years the works had treated 9,196,605 tons of ore, containing 5,305,979 oz. of gold and 139,427 tons of copper, and had paid £9,379,166 in dividends. It still contains approximately 8,000,000 tons of low-grade ore.

There is no 'reef' at Mount Morgan. The orebody is a mass of silicified quartz-porphyry, irregularly impregnated with pyrite and chalcopyrite (exceedingly variable in its gold and copper contents), intersected by three series of intrusives, and held, as in a cup, by a large intrusive mass of quartz-diorite. The oxidized portion of this body was of such size and richness as to puzzle early geologists, who advanced the now discarded theory of geyser action to account for it.

The town of Mount Morgan is wholly dependent upon the mine, and its population fluctuates with the number of the company's employees, the maximum having been about 16,000 (estimated). The mine is connected with Rockhampton by a rack-line up Razorback with a grade of 1 in 16; the line is continued southward to the coal-field of Baralaba and up the Callide valley. The average rainfall is 30.88 inches, and the mean average temperature 70.7°. To obtain fuel, fluxes, and supplies, the company's operations have extended far beyond Mount Morgan. Limestone came from Marmor, 50 miles away; coal from Baralaba (66), pyritic flux from Many Peaks (150), and ironstone was quarried at Iron Island, 145 miles by sea from Rockhampton.

See Sykes's *Mount Morgan Gold Mine* (1893), Bird's *Early History of Rockhampton* (1904), Rees Jones's *Gold Mining in Central Queensland* (1913), and the annual *Reports* of the company from 1886 to 1925. Notes on the geology of the district will be found in the *Transactions* of the Australian Institute of Mining Engineers (xv. 439 sqq.), and on the petrology in the *Transactions* of the American Institute of Mining Engineers (lv. 263 sqq.).

B.G.P.

Mucuna, a widespread tropical genus of the family Leguminosae, consisting chiefly of climbers. The flowers are large, purple, yellow, or nearly white, in clusters; leaves 3 leaflets; pod thick, clothed with stinging hairs which soon disappear. *M. gigantea*, the only indigenous species, is also common in India and the Pacific islands. The cooked seeds are eaten by the aborigines. The pulverized bark is used in India for rheumatism.

Mudie, JAMES (of whose early years, as of the latter end of his life, nothing is known), was at one time a sub-lieutenant of marines. In 1814 he commenced, and in 1820 published under royal patronage, a *Historical and Critical Account of a Grand Series of National Medals* covering the reign of George III. This ambitious work, which he declared cost him £10,000, proved a financial failure, and Mudie with his family migrated to New South Wales. He arrived in Sydney in July 1822 and received a grant of 2000 acres at Patrick's Plains on the Hunter River; this he named Castle Forbes, in honour of Sir Charles Forbes of London, who had assisted him to migrate. By 1834 (thanks to his son-in-law John Larnach) he had one of the best agricultural establishments in the colony, employing from 50 to 70 assigned convicts in normal times and up to 120 for harvesting. After the arrival of Governor Bourke in the colony the assigned servants at Castle Forbes became less amenable to discipline than formerly—a change which Mudie attributed to the governor's known leniency to convicts. Mudie had no patience with humanitarians, and considered that 'transportation should really be made to operate as a punishment.' In his own words he 'not only kept his convicts in their proper place, and at their proper distance, and compelled them to wear the regular convict dress, but he had the dress of each branded with a number, and with his own name as the assignee master.' Nevertheless the treatment of the servants at Castle Forbes did not seriously contravene colonial regulations.

In November 1833 a party of assigned convicts absconded from the estate and joined with others (also from the estate) who had recently been sentenced to the ironed gangs but had escaped custody; six returned on a robbing expedition and attacked Larnach with intent to murder, and for this five were condemned to death and one was sent to Norfolk Island for life. During the trial the prisoners made such an impassioned appeal against the harsh treatment meted out to them at Castle Forbes that the governor, though not delaying execution, thought it necessary to inquire into

these allegations; he satisfied himself that many of the complaints were ill-founded, but rebuked Larnach for certain proved instances of ill-treatment, and stationed a disinterested resident magistrate in the district to superintend the police. Public interest being roused, Mudie was bitterly attacked by the *Sydney Gazette* in articles which it was generally agreed were written by the sub-editor—William Watt, a ticket-of-leave man; Mudie pursued him with unabated hatred thereafter and repeatedly brought him before the courts, attempting during the trials to show that Watt had the backing of the local government. Bourke thereupon sent Watt to Port Macquarie to be out of the way, and in January 1836 issued a new commission of justices of the peace, from which Mudie's name was omitted.

Convinced that this was a pandering to the convict population, Mudie did not care to return to Castle Forbes, disposed of his property (except a few acres at Maitland), and left for England on 31 March 1836. He had in 1834, after the inquiry at Castle Forbes, issued a pamphlet in vindication of his and Larnach's actions, and had sent a copy to the colonial office. After reaching England he prepared for publication *The Felonry of New South Wales* (1837) 'to expose the convict propensities of the present colonial government;' it is an intemperate attack on certain aspects of Bourke's administration and on prominent colonists who for one reason or another had displeased the author. There are serious defects in the pagination of the *Felonry*, but it is probable that these are merely printer's errors.

In 1837 he gave evidence before the select committee on transportation, denouncing lengthily the depravity of the convicts. In 1839, being desirous of returning to New South Wales, he applied to the colonial office for a grant of 560 acres of land which he had forfeited through a technicality in 1830; this claim was not allowed, nor was an application to take a number of shepherds, agricultural servants, and mechanics to the colony on the bounty system. He reached Sydney on 2 June 1840 in failing health. On 2 September he was horsewhipped in the street by the son of John Kinchela (q.v.). He brought an action for assault, was awarded £50 damages and costs, and then thought it best to leave the colony. Nothing more is known of him.

His sobriquet 'The Major' was an abbreviation, according to Judge Therry, of 'Major Medallion' derived from his association with the commemorative medals of 1820.

Mud-lark. See MAGPIE-LARK.

Mud-skippers or **Climbing-fish,** small marine amphibious fishes (Periophthalminae) which leave the water at low tide to move about freely upon mud-flats in search of the small crabs and insects upon which they feed. They enjoy the hot sun of the tropics, and keep themselves moist only by occasional dips in some shallow puddle. So fond are they of the freedom of the mud-flats that, if threatened with danger, they commonly skip across the surface of a stream to a neighbouring bank without submerging themselves for a moment. Their pectoral and ventral fins are modified to form arm-like limbs, which enable them to clamber over the mud and even to climb among the aerial roots of mangroves. Their eyes can be elevated upon short stalks, and see as well out of the water as in it.

The commonest species, *Periophthalmus koelreuteri,* is widely distributed throughout the tropical parts of the Indian and Pacific oceans, and reaches a length of about four inches; a larger relative grows to ten inches, and is esteemed as food by the Chinese in Queensland. See GOBIES.

A.R.McC.

Muehlenbeckia. See POLYGONACEAE.

Mueller, SIR FERDINAND JAKOB HEINRICH VON (1825-1896), was born of Danish parents at Rostock in Mecklenburg-Schwerin on 30 June 1825, educated at Schleswig and the university of Kiel (where he studied chemistry and took his Ph.D. degree in 1846), and from 1840 to 1846 carried out independent botanical researches in Schleswig-Holstein. A tubercular diathesis drove him to migrate to Australia; he reached Port Adelaide on 18 December 1847, obtained employment as a chemist, and for the next four years in his leisure time made botanical investigations in the Flinders Range, the vicinity of Lake Torrens, the Murray scrubs, Mount Lofty, and the coastal fringe at Guichen Bay. His earliest papers on the Australian flora appeared in German magazines at Adelaide. In 1852 he and Dr. Souller published a paper in a Halle journal, and he prepared one on the South Australian flora for the Linnean Society of London.

In 1852, on Sir Joseph Hooker's recommendation, he was appointed by Latrobe government botanist of Victoria, and during the next three years traversed south-eastern Australia from the mouth of the Darling to eastern Gippsland and from the Kosciusko plateau to Wilson's Promontory, doing pioneer work in the Alpine regions, ascending and naming hitherto untrodden peaks, adding materially to our knowledge of the Victorian flora, and ascertaining the suitability of various districts for settlement. In 1855 he accompanied Augustus Gregory (q.v.) as phytographic naturalist on an expedition formed with the object of tracing the Victoria River in the Northern Territory to its source. A result of the expedition was to increase the list of the flora of Australia by hundreds of new species. In 1857, in order to make the Melbourne botanical gardens more useful for economic and scientific ends, Mueller was appointed director, a position which he held until 1873; then the positions were again divided, a curator being appointed to control the gardens, while Mueller retained the position of government botanist. Under his directorship of the gardens great attention was paid to the encouragement of forestry, the acclimatization of useful plants, and the closer study of the native flora; and an economic museum, a library, and a national herbarium were established.

His botanical explorations did not end with the Victoria River expedition. In 1867 he investigated the country behind King George's Sound towards the Stirling Range, and in 1877 the vicinity of Shark Bay; he also travelled in the Tasmanian highlands. To the explorations of others he always gave practical encouragement, and greatly aided Giles, Forrest, Tietkens, Burke and Wills, and others; he raised funds for expeditions to New Guinea, and formed an Australian Antarctic committee which aided the *Antarctic* to visit South Victoria Land in 1894 (see ANTARCTICA). Among other activities he helped in 1854 to found the Royal Society of Victoria. In 1871 the King of Wurtemberg created him a hereditary baron, thus making him 'von Mueller.' For his botanical work—

and especially for his introduction of the blue gum (*Eucalyptus globulus*) into South Africa, the Mediterranean lands, and the temperate regions of South America—he received honours from France, Spain, Portugal, Italy, Austria, Denmark, Holland, Sweden, and eight German kingdoms; the Linnean Society made him a fellow in 1859, and the Royal Society in 1861. Industrious to the last, he died at Melbourne after a short illness on 10 October 1896.

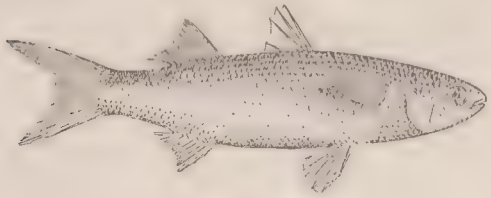
Von Mueller's written work was extraordinarily extensive. Possibly his most important work was the *Fragmenta Phytographiae Australiae* in 11 volumes, issued at intervals between 1858 and 1881. His *Plants Indigenous to the Colony of Victoria* (2 vols., 1860-5) and *Key to the System of Victorian Plants* (2 vols., 1885-7) are also of great value, and he co-operated with George Bentham in a 7-volume *Flora Australiensis* (1863-78), which depended materially on Mueller's specimens and notes. Among his other work may be noted *Select Extra-Tropical Plants* (1881), *Eucalyptographia* (1879-84), a *Systematic Census of Australian Plants* (1882-5) with its supplement of 1889, and an *Iconography of Australian Salsolaceous Plants* (1889-91). His minor contributions to botanical science are innumerable, and are scattered through the publications of learned societies all over the world. (C.M.G., 1869; K.C.M.G., 1879.) C.D.

Muir, Thomas (1765-1798), born at Glasgow on 24 August 1765, was the son of a prosperous tradesman who in 1753 published a pamphlet on English trade with foreign countries. He was educated at the grammar school and the university of Glasgow (M.A., 1782), where he read law after graduating, but was expelled in 1784 for lampooning professors. In 1787 he betook himself to Edinburgh, where he was admitted to the faculty of advocates: he also became an elder of the church at Cadder near Glasgow, and sat in the general assembly. Interesting himself in the advocacy of parliamentary reform, he in 1792 helped to found in Glasgow a branch of the London 'Friends of the People,' and at one meeting read a communication from the United Irishmen. The British government, scared by the outbreak of the French Revolution, was inclined to take the mildest suggestion for parliamentary reform as a threat of a similar outbreak in Britain; Muir was arrested on 2 January 1793 on a charge of sedition, liberated on bail, and outlawed because he did not return from a visit to Paris by the day set for his trial (though he was on his way back). On 31 August 1793 he was sentenced to transportation for 14 years—it is alleged, probably with truth, that the jury was packed and the presiding judge (the notorious Lord Braxfield) bitterly antagonistic. A fortnight later Thomas Fyshe Palmer (q.v.) was condemned on a similar charge and given a seven years' sentence, and thenceforth they were companions in misfortune. At the end of November they were sent by sea from Edinburgh to London, and at first put in irons and set to the same work as the worst convicts; but a warning came from Edinburgh that, if persons like Muir and Palmer were treated as felons, Scottish juries would refuse to convict in treason cases. In January 1794, therefore, they were un-ironed, segregated from the mass of convicts, and allowed to see their friends. In February they, along with Maurice Margarot and William Skirving (who had been convicted of the same offence, sedition), were placed aboard the transport *Surprize*; a fifth convict, Joseph Gerrald, was embarked in the *Sovereign*, which followed the *Surprize* to Australia at a short interval, and the five became widely known as the 'Scottish Martyrs.' Margarot's wife was allowed to travel with her husband. The *Surprize* sailed on 2 May and reached Port Jackson on 25 October. During the voyage Palmer and Skirving were accused of having fostered, if not devised, a serious mutiny, and were placed under close arrest; Muir, who had been very ill, was not considered an accomplice, and Margarot was taken into favour as an informer. Margarot, indeed, was according to Muir 'rejected and expelled from our society' as soon as the Martyrs reached New South Wales. The charges against Palmer and Skirving were not substantiated, and Grose assured them that they would receive every possible indulgence so long as they kept clear of politics; as for Muir, he could not speak too highly of his treatment—'gratitude will for ever bind me to the officers, civil and military.' Grose had already been instructed from London that the Scottish transportees must not be assigned compulsorily to any service, though, unless they performed such work as Grose offered them, they could not claim rations from the government; Hunter a year later stated that they had been 'particularly cautious' to claim nothing of the kind. Muir, Palmer and Skirving were allotted neighbouring houses on the eastern bank of the Tank Stream, and Muir bought a farm on the slopes of what is now Gore Hill; he named it 'Hunter's Hill,' after his father's home in Scotland, but the name has since been transferred to a peninsula south of it across the Lane Cove River. Considering himself a free man within the settlement, Muir busied himself with the amelioration of the convicts' lot, and conducted the first Presbyterian services held in New South Wales. Hunter, when he arrived in 1795, described Muir as 'a sensible, modest young man, of a very retired turn;' Skirving was 'sensible and well-informed,' Palmer by no means turbulent and restless (as he had been described), and Margarot talkative and a grumbler. Within a week of meeting them Hunter had conceived scruples about his power to detain them in the settlement. He inclined to the acceptance of their representations that their sentences contemplated only (*a*) transportation and (*b*) interdiction from a return to Britain, and suggested to the authorities in London that they might be allowed to return to Ireland. The suggestion was sternly rejected. In June 1797 he was told that it was his duty 'to detain those persons within your Government until the terms of their respective sentences are compleated.' Meanwhile, however, an American brig, the *Otter*, visited Port Jackson at the beginning of 1796, and Muir on 11 February went clandestinely aboard her and escaped; it was believed that her visit was designed for his rescue. She took him to Nootka Sound in Alaska (an unusual port for a vessel primarily intended to rescue a prisoner), whence he worked his way down the American coast to Panama, crossed the isthmus, and shipped aboard a Spanish frigate to Cuba; the governor there detained him as a suspect republican and sent him to Cadiz, but on the way the frigate was captured by two British men-of-war, and Muir in the fight was severely wounded in the face. He was put ashore in Spain with the other wounded, and at the request of the French Directory was released by the Spanish government and allowed to go to France. But his wound proved incurable, and he died at Chantilly near Paris on 27 September 1798.

The remaining martyrs may be conveniently dealt with here, except Thomas Palmer, who is separately treated. Gerrald, who had been ill ever since his conviction, bought a small house at Farm Cove; Hunter gave him every possible privilege, but he died of phthisis on 16 March 1796. Skirving bought a farm near Muir's, overworked himself at the first harvesting, and died of dysentery on 19 March 1796. Margarot, a far less educated and refined man, served out his sentence in the colony. In 1804 Governor King, suspecting that he was mixed up in the abortive revolt of that year (see IRISH EXILES), had his house searched, and discovered 'some very elegant Republican Sentiments, and general infamous Abuse of every person in the Colony, from the period he landed.' To prevent himself from being sent to the coal-mines, Margarot then declared that he was employed by high authorities in England to send secret reports on King's conduct; and the governor, half-believing it, 'directed him to be supplied with pens, ink and paper.' In 1805, however, his conduct became unbearable, and King exiled him to Tasmania, where he exasperated Colonel Collins into vehement denunciations. In 1807 his sentence expired and he returned to England, where he died in poverty on 11 November 1815.

Mulga. See ACACIA.

Mullet, Gray, members of the family Mugilidae; about two dozen species are known from Australia, nearly all valuable as food-fishes. They are chiefly marine in habit, but may enter fresh water periodically, and one, the Pink-eye Mullet (*Trachystoma petardi*), is restricted to the fresh water of the eastern rivers of New South Wales. The so-called Sea Mullet (*Mugil cephalus*) is one of the most important fish marketed in New South Wales; it occurs in enormous quantities in inlets, as



Sea Mullet.

well as on the open coast, is captured by net-fishermen in greater or less abundance throughout the year, and occasionally attains a length of 30 inches. When migrating northwards (about April or May), its shoals hug the coast-line, often swimming among the breakers; this makes it impossible to use a drift-net for their capture. This species ranges over the temperate seas of the world, and is known by various names in the several Australian States, being called 'sand mullet' in Victoria and Tasmania and 'mangrove mullet' in Queensland. The Sand Mullet or Tallegalane (*Myxus elongatus*) of New South Wales is less valuable as a food-fish, although at times plentiful in the markets. Other allied species are the Flat-tailed or Fan-tailed Mullet (*Mugil argenteus*), the Diamond-scale Mullet (*M. waigiensis*), the Silver Mullet (*M. georgii*), and a number of less-known species, each of which has various vernacular names. In all members of the family the teeth are either minute or wanting, and the peculiarly-formed mouth is especially adapted for engulfing the microscopic organisms which supply them with food. For red mullet see GOAT-FISH.

A.R.McC.

Mundy, GODFREY CHARLES, joined the army in 1821 (lieutenant, 1823; captain, 1826; major, 1839; lieutenant-colonel, 1845; colonel, 1854), and served at the siege of Bhurtpore (Bharatpur) in 1825-6 as aide-de-camp to Lord Combermere. In 1832 he published *Pen and Pencil Sketches: the Journal of a Tour in India* (3rd edn., 1858). On 25 June 1846 he arrived in Sydney as deputy-adjutant-general of the military establishment, and remained there until 25 August 1851. During these five years he employed his leisure in writing amusing sketches of colonial society in New South Wales, Victoria, Tasmania, and New Zealand; these were published in 1852 under the title *Our Antipodes* (2nd edn., 1852; 3rd edn., 1854; 4th edn., 1857). In 1857 he was appointed lieutenant-governor of Jersey, an office which he held until his death on 10 July 1860.

Munro, JAMES (1832-1908), born in Sutherlandshire, Scotland, on 7 January 1832, at the age of 16 entered the employ of Constable and Co., printers, Edinburgh. Migrating to Melbourne in 1858, he continued to work at his trade for six years, but in 1865 founded a building society which became the largest in Victoria, and between that date and 1887 founded and directed a woollen mill, an insurance company and two banks. Entering local politics in 1874, he attached himself to Graham Berry (q.v.), was minister of public instruction in that leader's short-lived cabinet of 1875, stood aside from the intrigues which occupied the next ten years, and became prominent again as leader of the opposition to the Gillies-Deakin coalition of 1886. In 1890 he visited England and procured a large amount of British capital for his various companies; on the strength of his consequent reputation as a successful financier he ousted Gillies (whose financial policy was collapsing) and formed a cabinet chiefly remarkable for the inclusion of William Shiels and George Turner. As premier he was a member of the federal convention of 1891, but took no great part in the debates. In February 1892 Munro, gladly extricating himself from the disastrous crisis of 1891-3, succeeded Graham Berry as agent-general for his colony; but among the worst failures of those years were his two banks, and one of the first acts of the Patterson ministry of 1893 was to recall him and replace him by Duncan Gillies. After his return to Victoria he took no further part in politics, and died at Melbourne, on 25 February 1908.

Murdoch, WILLIAM LLOYD (1855-1911), born at Sandhurst—now Bendigo—in Victoria on 18 October 1855, a solicitor by profession, was the most graceful and accomplished Australian batsman of the eighties and in 1882-4 ranked second only to W. G. Grace among the batsmen of the world. His first appearance in test cricket was made at Melbourne in April 1877 against Lillywhite's eleven; he went to England in D. W. Gregory's team of 1878—which got an M.C.C. team out for 19 runs (see CRICKET)—mainly on the strength of his wicket-keeping; and he was a member of the team that defeated Lord Harris's eleven at Melbourne in January 1879. Up to that time his batting had not been brilliant, but then he suddenly developed into a great batsman, captained the next three Australian teams in England

(1880, 1882, 1884), and distinguished himself equally in both capacities. His score of 211 in the test match of August 1884 still ranks as the highest but one made in test cricket, being excelled only by R. E. Foster's 287 in December 1903. At the end of 1884 he retired from big cricket, but returned to it in 1890 to captain the Australian team of that year in England. From 1891 onwards he lived in England, captaining the Sussex team on several occasions and playing for London County under the leadership of W. G. Grace. As late as 1904, when he was 49 years old, he scored 140 for Gentlemen against Players. Outside test cricket he played, while in Australia, for New South Wales, scoring 321 in an intercolonial match in 1882. On 18 February 1911, during a visit to Australia, he died of apoplexy while watching a match between Australia and South Africa on the Melbourne cricket-ground. In test matches he scored 896 runs, an average of 32; in first-class cricket (including tests) 17,319 runs, an average of 26.64.

J.C.D.

Murphy, Francis (1795-1858), born at Navan in Ireland on 20 May 1795, educated at the diocesan seminary and St. Patrick's College, Maynooth, and ordained priest in 1826, after 11 years of work in Bradford and Liverpool met Dr. Ullathorne—who described him as 'a priest of six-priest power'—and aided him in obtaining young priests for the diocese of Sydney. Reaching Sydney with them on 15 July 1838, he was given work in the city by Bishop Polding, and in 1840 succeeded Dr. Ullathorne as vicar general, administering the diocese during Bishop Polding's absence in Europe. On 8 September 1844 he was consecrated first bishop of Adelaide, where at the moment there was 'neither church nor school nor government aid of any kind whatsoever' for Catholics; but soon after his arrival there an English convert to Catholicism, William Leigh, gave the diocese £2000, 500 acres of land in the colony, and a further 4 acres in Adelaide as the site of a cathedral. This cathedral Dr. Murphy began to build when the wealth of the Victorian goldfields was found to be flowing across the border in return for South Australian wheat; but the earlier struggles had debilitated him and he died of phthisis on 26 April 1858.

E.M.O'B.

Murphy, Sir Francis (1809-1891), born at Cork in Ireland and educated at Trinity College, Dublin and the Royal College of Surgeons in London (M.R.C.S., 1835), migrated to Sydney in June 1836 and was made district surgeon for Bungonia near Goulburn on 1 January 1837. He soon relinquished his profession for the more congenial life of a farmer and squatter, growing wheat in the Goulburn district in the early forties and leasing for a sheep-station 50,000 acres at Tarrawingee near Beechworth in 1844. When Victoria in 1851 became a separate colony, Murphy entered the council as member for the Murray and was made chairman of committees; he gave up the management of his station (which he sold in 1857) and thenceforth resided in Melbourne. When in 1856 responsible government was initiated, he was returned by the Murray electorate to the new assembly, and was chosen as speaker—having given an undertaking, which the other candidate refused to give, that he would take no active part in any debates; he represented the Murray until 1866, and then became member for Grenville, and held the speakership continuously until 1871, when he failed to secure re-election to parliament. From 1872 to 1876 he sat in the council as a member for the Eastern province, but took no active part in politics. Retiring into private life in 1877, he died at Melbourne on 30 March 1891.

Murphy's services to his colony were considerable. In the council of 1851-6 he carried important pastoral legislation, and combined with his political duties those of chairman of the central road board, taking also a useful part in the debates on the new constitution. As speaker of the assembly he was, of course, debarred from political work, but his moderating influence was conspicuous during the long quarrel between the two houses in 1864-8. He was a member of the commission on the Burke and Wills expedition of 1863; also a member of the council of the university from 1853 until the end of 1878. (Kt.Bach., 1861.)

Murray, George Gilbert Aime, third son of Sir Terence Aubrey Murray (q.v.), was born in Sydney in 1866, left Australia at the age of 11, and was educated at Merchant Taylors' school, London, and St. John's College, Oxford (M.A., 1904, and D.Litt. Oxford, 1910; LL.D., Glasgow, 1900; LL.D., Birmingham, 1909). He was elected fellow of New College, Oxford, in 1888, was appointed professor of Greek at the university of Glasgow in 1889, and held that post for 10 years. After an interval of eight or nine years, during which he wrote two actable plays (*Carlyon Sahib* and *Andromache*), produced critical work upon Euripides, and translated a number of that author's tragedies into English verse, he was appointed (1908) regius professor of Greek in the university of Oxford. Since that time he has translated plays of other Greek dramatists, and has written books, essays, and addresses on many subjects, ancient and modern. Gilbert Murray is a brilliant example of the newer order of classical scholar, who can take a lively practical interest in current questions and business while assiduously prosecuting his special studies. In his endeavour to bring the classics 'down from the clouds' he has produced versions which enjoy a wide popularity, although competent critics mostly agree that his method is apt to clothe his originals in a somewhat false atmosphere of modernity; his versions have been styled 'a muriate of Euripides.' His other writings are original in thought and bright in style. He was made trustee of the British Museum in 1914, has been chairman of the League of Nations Union since 1923, and is a fellow of the British Academy and of the Royal Society of Literature. Apart from his translations his chief writings have been *The Rise of the Greek Epic* (1907), *Five Stages of Greek Religion* (1913), *Stoic Philosophy* (1915), *Faith, War, and Policy* (1918); *Collected Essays and Addresses* (1922).

Murray, Harry William, born at Launceston in Tasmania on 1 December 1884, was the best-known fighting soldier of the A.I.F. Murray, who had served in the Australian field artillery for some years and had worked on the mining-fields, landed on Gallipoli as a private in the machine-gun section of the 16th battalion in which Lance-corporal—afterwards Major—Percy Black, also a miner and a famous fighter, was his immediate senior. After fighting Turks in both front and rear at the landing on Gallipoli, for which he received the D.C.M., Murray was promoted, and, as an officer of the 13th battalion in France, conducted a brave but unsuccessful advance near Mouquet Farm

during the Somme battle of 1916. The gallantry and skill with which he extricated his company brought him the D.S.O. For his leading of the 13th, and 'for most conspicuous bravery,' in an attack at Stormy Trench during the following winter he was awarded the Victoria Cross; and for his gallantry in the first battle of Bullecourt in April 1917 he was given a bar to his D.S.O. He rose through the various ranks (sergeant, 1915; 2nd lieutenant, 1915; lieutenant, 1916; major, 1917; lieutenant-colonel, 1918), and subsequently commanded the 4th machine-gun battalion. (C.M.G., 1919.) C.E.W.B.

Murray, JOHN. See EXPLORATION BY SEA.

Murray, SIR JOHN HUBERT PLUNKETT, the second son of Sir Terence Aubrey Murray (q.v.), was born at Sydney on 29 December 1861 and educated at the Sydney Grammar School, University College, London, and Magdalen College, Oxford (B.A., 1886), and also studied at Berlin. While at Oxford he won the heavy-weight amateur boxing championship of England, and distinguished himself as an oarsman and swordsman. In 1886 he was called to the bar at the Inner Temple, and returned to Australia to practise. In 1901 and 1902 he acted as a district court judge. As a volunteer he joined the first New South Wales regiment of infantry, and afterwards transferred to the New South Wales Irish Rifles, which he commanded in 1898. During 1900-1 he served in the South African war, and in recognition of his services was in 1902 awarded the rank of major in the British army. In 1904 he retired from military life with the rank of lieutenant-colonel, and was appointed chief judicial officer of British New Guinea, becoming as such a member of its executive and legislative councils. In April 1907, British New Guinea having in September 1906 become a territory of the Commonwealth under the name of Papua, he was made acting administrator, and in 1908 was promoted to the lieutenant-governorship, which position he still (1926) holds. In 1919 he was chairman of a royal commission on the Mandated Territory of New Guinea, and delivered a minority report suggesting the amalgamation of that territory with Papua.

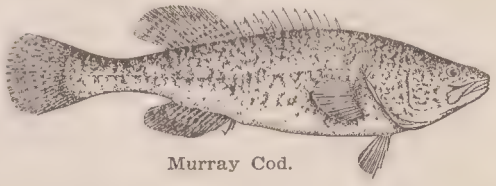
In developing the policy of Sir William MacGregor (q.v.) Murray at first incurred the resentment of many white planters, who considered that their interests and the economic progress of the territory were being unduly sacrificed to those of unmanageable and ungrateful natives; this resentment, however, has died away, and it has been found possible to extend the area of plantation and foster white enterprise without in any way neglecting or diminishing the welfare of the native tribes. In 1912 Murray published *Papua; or British New Guinea from 1907 to 1920,* and in 1925 *Papua of To-day.* His annual *Reports* are valuable storehouses of ethnological and historical information. (C.M.G., 1914; K.C.M.G., 1925.) See PAPUA. L.A.

Murray, SIR TERENCE AUBREY (1810-1873), born at Limerick in Ireland in 1810 and educated at Dublin, was son of a Terence Murray who was paymaster of the 48th regiment, and served with it in New South Wales from 1817 to 1824. Soon after the regiment was transferred to Madras, Murray disposed of his commission, returned to Ireland, and in 1827 fetched his son to Australia to take up farming there. Terence spent four years on his father's estate at Taradale near Lake George, and then—having been made a magistrate by Bourke—guided the mounted police in a campaign against bush-rangers in the Murrumbidgee and Monaro districts. Towards the end of the thirties he took up Jingellic station on the upper Murray and occupied the land across the river afterwards known as Jingellic South. In June 1843 he entered politics as member of council for Murray, King and Georgiana counties; this seat he held till 1851, when he became member for the Southern Boroughs (Goulburn, Queanbeyan, Braidwood, and Yass). The same constituency returned him to the new assembly from 1856 to 1859, and he represented Argyle from 1859 to October 1862. He was then nominated to the legislative council, and retained the position till his death on 22 June 1873.

Murray's parliamentary career was not marked by any special legislative achievement, but was useful in another direction. He was secretary for lands and works in the first (1856) and second (1857-9) Cowper ministries, but resigned in January 1858 to make room for John Robertson. On 31 January 1860 he was unanimously chosen to succeed Sir Daniel Cooper as speaker of the assembly, and only left the chair on 14 October 1862 to succeed W. C. Wentworth as president of the legislative council. For such posts, requiring in their holder dignity, equability, and impartiality, Murray was well fitted, and his tenure of them advantaged both the houses and the colony. (Kt. Bach., 1869.)

Murraya, a small genus of the family Rutaceae, consisting of trees or shrubs, chiefly tropical. The calyx is 5-cleft; petals 5, narrow; stamens 10, free; fruit a 2-seeded berry. *M. exotica* (China Box), found in north-eastern Queensland, has very fragrant white flowers, and is commonly cultivated in gardens. The wood is light-yellow and close-grained, but apt to crack; it has been tried for wood-engraving (for which there is now little demand), and is used for the handles of implements. Suggestions have been made for the extraction of a perfume from the flowers.

Murray Cod (*Oligorus macquariensis*), the most valuable freshwater fish of the southern half of Australia; it inhabits the whole Murray River system and the head-waters of some coastal streams of New South Wales and southern Queensland. Attempts to transfer it to the Yarra system in Victoria failed, but it was



Murray Cod.

successfully colonized in Lake George,. and throve there until the lake practically disappeared through evaporation. It attains a length of six feet and a weight of 150 pounds. It is an excellent food-fish, and a considerable number of inland fishermen are engaged in its capture, forwarding their catch to the markets of Sydney, Melbourne, and Adelaide. A.R.McC.

Murrells, JAMES. See WILD WHITE MEN.

Muscovite. See MINERALOGY.

Museums. Each of the six states has in its capital city a museum, an art gallery, and

a public library. These are often housed in the one building, so that any description of the museums must to some extent overlap the articles on ART GALLERIES and LIBRARIES, which should be consulted. Outside the capital cities there are many small collections of the museum type (see MACLEAY, ALEXANDER and MACLEAY, WILLIAM).

The Australian Museum.—In a despatch dated 30 March 1827 Governor Darling was informed that the colonial office sanctioned an expenditure of £200 a year on the establishment of a museum in Sydney, and that W. Holmes had been appointed zoologist. During the first two decades of the museum's life it had no regular abode, but was housed at first (1830) in the judge-advocate's office—where the lands office now stands. Thence it was moved to the legislative council chambers, and in 1836, owing to the growth of the collection, shifted again to Judge Forbes's house at the corner of Bridge- and Gresham-street; at this time, according to its first catalogue (1837) it included 800 exhibits. In 1840 it was transferred to the surveyor-general's office opposite the mint; about 1842 it was placed in the Darlinghurst courthouse. The original name of this migratory museum was 'The Colonial Museum,' but in 1834 it was given its present name.

Darling in 1831 reserved an allotment in Hyde Park for a building to be put up by the Australian Subscription Library—a private society, which obtained this concession on condition that rooms in the building should be set aside for the colonial museum. In 1835, however, Bourke reversed the arrangement, and proposed to erect in connection with the botanic gardens a museum in which accommodation might be given to the society's library; in April 1836 the colonial office sanctioned the expenditure of £4000 on such a building. In June of that year occurred the first recorded meeting of the 'General Committee of the Australian Museum and Botanical Gardens'—a body consisting of Alexander and George Macleay, Phillip Parker King, John Vaughan Thompson (deputy-inspector-general of hospitals), Edward Deas Thomson, Charles Sturt (the explorer), John Jamison, William Macarthur, George Porter, and R. A. Wauch, the first six forming the museum sub-committee. Nothing, however, was done about the building until 1845, when Charles Nicholson (q.v.) persuaded the legislature to authorize a commencement of the building opposite Hyde Park in which the museum is now housed. Part of the existing north wing was completed in 1849, and the collections were transferred to it from the court-house. It was also used by local societies for their meetings, and in 1854 for the display of specimens collected for the Paris exhibition of agriculture and industry of 1855. The west wing of the building was begun in 1861; in 1892 an upper story was placed on the north wing; in 1897 the south wing was begun, and was enlarged in 1909.

The system of administration—by a curator acting under a managing committee—was altered in 1854, when a board of trustees was substituted for the committee. Originally this board consisted of 12 members holding official positions, who, when they left office, vacated the trusteeship in favour of their respective successors; 12 nominees holding the position for life, whose successors would be co-opted by the board; and one appointed by the governor-in-council. In 1902 five more official trustees were added. The list of actual custodians of the exhibits, with their titles, is as follows:—

1828-30. William Holmes, colonial zoologist.
1836. George Bennett, zoologist, curator, and director (these titles seem to have been used indiscriminately).
1841. William Branwhite Clarke, curator.
1842. William Sheridan Wall, curator.
1850. Simon Rood Pittard, curator.
1861. Johann Ludwig Gerhard Krefft, curator.
1874. Edward Pierson Ramsay, curator.
1895. Robert Etheridge, junior, curator (1917, director and curator).
1920. Charles Hedley, acting-curator.
1921. Charles Anderson, director.

Prominent among the museum's contents are the Hargraves collection of shells presented by Thomas Walker; Day's types of Indian fishes; the Waterhouse collection of Lepidoptera presented by G. A. Waterhouse; the Roth collection of Queensland ethnography; the Stockdale collection of aboriginal weapons and implements presented by William Dixson, and the Grant ornithological collection. Besides these collections, which are of the 'study' type, the museum galleries display fine collections in all departments of natural history except botany, which is treated by the national herbarium attached to the botanic gardens (q.v.). Among the exhibits are the journal of Cook's first voyage, known as the 'Batavian' copy, presented by F. H. Dangar, two Egyptian mummy-cases presented by Sir Robert Lucas-Tooth, a group of aboriginal figures modelled from life by T. Rayner Hoff (the gift of E. Wunderlich), and numerous habitat groups. The ethnology of the Pacific is illustrated by one of the most complete collections extant. The publications issued are extensive, the principal being the *Records*, a serial established in 1890 and still being issued; other scientific publications include memoirs, catalogues, special catalogues, and monographs. Besides these a non-technical quarterly, *The Australian Museum Magazine*, first issued in 1921, is published with the object of bringing the museum into closer relationship with the lay public.

The *Technological Museum* at Sydney originated as a collection of industrial exhibits in the Sydney exhibition of 1881 (see EXHIBITIONS), but this, with the ethnological series amassed by Edward Pierson Ramsay (q.v.), was destroyed by the fire of 1882. Ramsay energetically set about replacing his lost specimens, and the technologic collection was thereafter temporarily housed in the Agricultural Hall, Outer Domain, until it was transferred to Ultimo (an outlying ward of Sydney). The first managing committee, which consisted of Sir Alfred Roberts, Professor Liversidge, and Robert Hunt, planned a museum of a purely industrial nature on the lines of the Victoria and Albert Museum in South Kensington, London, and this was opened on 4 August 1893. Its objects are (*a*) to assist the development of the State's natural resources by exhibiting collections of its raw products, investigating their economic possibilities, and publishing results for the benefit of manufacturers and traders, (b) to exhibit, both for comparison and for general information, economic products of the world at large, gathering and disseminating all available information about them. Research is particularly encouraged, and during the last 30 years more than 250 original studies of relevant subjects have been published. The exhibits connected with building stones, timbers, essential oils and kinos, and the porcelain in-

dustry, are especially valuable, and the collection that illustrates the development of the wool industry in Australia contains specimens put aside in 1804 by Samuel Marsden.

The *National Museum* at Melbourne originated in a collection illustrating Victorian natural history and geology made under the direction of Captain Andrew Clarke (q.v.); these were removed to the university building in 1856, and Professor Frederick McCoy was appointed director in 1858. In 1862 the collection was removed to a 'National Museum' built in the university grounds, and in 1870 was placed under the control of the library trustees, who thus became 'Trustees of the Public Library, Museums, and National Gallery.' McCoy was director till his death in May 1899; Professor Baldwin Spencer succeeded him, and at the end of the year the collections were moved to a building in the public library, which was formally opened on 19 December. In 1906 the central block of the existing Russell-street museum was opened. Among notable exhibits are many mammals secured for the museum by John Gould and J. E. Gray, and three examples of gorillas collected by Du Chaillu; the H. L. White collection of Australian birds' skins, the Campbell collection of Australian eggs; a large number of fishes from the Godeffroy and Bleeker collections; the Curtis collection of British insects (15,780 specimens) together with Curtis's types, notebooks, etc. secured in 1864; and the Howitt (44,800 specimens) and Castelnau collections of insects. Palaeontology is illustrated by the Bean collection of plants from the upper Jurassic of Scarborough; the Lycett collection of Oolitic fossils (3100 specimens); the Wright collection of Jurassic forms (2000 specimens); and the Krantz collection, numbering 20,000 examples. The Australian geological collections are strong in Tertiary fossils, and include those made by MacGillivray, Dennant, and Creswell. The Hall graptolite series for Victoria contains 1500 type-fossils. The Australian ethnological collection is especially strong in sacred and ceremonial objects, and contains most of those figured by Brough Smyth, and all those figured by Spencer and Gillen, together with their negatives and kinematographic and phonographic records illustrating all phases of native life. The stone implement collection contains over 20,000 specimens.

The *Industrial and Technological Museum*, Melbourne, was established in 1870, under the control of the trustees of the public library. The collections were housed at first in a building which had been erected in the library grounds for the exhibition of 1866, and the mining and other models which had been exhibited at the national museum were transferred to it. In 1893 a special hall was erected in the same grounds, and the collections were shown in it till in 1899 it was needed to accommodate the natural history section of the national museum. The exhibits were then stored until, on the completion of the new library building, the Queen's hall (the old reading-room) could be utilized as their temporary home. Here they were thrown open to the public in 1915.

The *South Australian Museum* at Adelaide was first opened in the building of the South Australian Institute in 1862; its contents were chiefly local minerals and fossils. In 1884 the west wing of the public library was completed, and the northern half of the building was set apart for the museum. A separate building for the natural history museum was opened in 1895, and the eastern wing of the public library block, opened in 1915, is now used principally as an extension of the natural history museum. The Australian ethnological collection is perhaps unexcelled in the world, and the mineralogical collection is also exceptionally good. The exhibit of more than 400 skulls of Australian aborigines is of interest to anthropologists the world over. The museum possesses an almost complete skeleton of *Diprotodon australis*, plaster casts of which have been sold to some of the principal museums of Europe and America. A large deposit of bones, discovered in 1892 at Lake Callabonna (about 150 miles east of Hergott), contained not only bones of *Diprotodon*, but also remains of a large extinct struthious bird (*Genyornis newtoni*), of the giant wombat (*Phascolomys gigas*), and of several species of extinct kangaroos.

Since its inception the museum has been in charge of the following officials:—

1862. F. L. Waterhouse, curator.
1882. William Haacke, curator.
1889. Edward Charles Stirling, honorary director.
1894. E. C. Stirling, director.
1913. Edgar Ravenswood Waite, director.

A bequest of £16,000 from the Morgan Thomas estate affords funds for the purchase of collections, the despatch of expeditions to the interior, and (since May 1918) the publication of *Records of the South Austra'ian Museum*. For further notes on the founding of the museum see *Transactions* of the Royal Society of South Australia vol. i (1877).

The *Queensland Museum* at Brisbane originated in the enthusiasm of certain local naturalists, among whom was Charles Coxen, a relative of the ornithologist John Gould. In 1855 the collections were housed in the so-called 'observatory' building on Wickham-terrace, but were afterwards removed to the old parliament-house and then to the old post-office building in Queen-street. In 1876 a board of trustees was appointed, with A. C. Gregory as chairman, and the name 'Queensland Museum' was officially given to the institution. In 1879 it had grown beyond its accommodation and was moved for the fourth time, to occupy what is now the public library in William-street, William A. Haswell being at the same time appointed curator. With the addition of the Sir William Macgregor ethnological collection from Papua the museum again became overcrowded and in 1900 was removed to the exhibition building in Bowen Park, where it is still housed. The two floors of the large hall (214 ft. x 86 ft.) are mainly devoted to natural history and ethnology. There is an exceptionally fine collection of vertebrate fossils, and many water-colour pictures by Ellis Rowan illustrating the flora of the State are on exhibition. Between 1891 and 1911 ten volumes of *Annals* were published; since 1911 eight volumes of *Memoirs of the Queensland Museum* have appeared. The officers in charge of the museum have been:—

1855. Charles Coxen, secretary and curator.
1873. Karl T. Staiger, custodian.
1879. William A. Haswell, curator.
1881. Frederick Manson Bailey, acting-curator.
1882. Charles W. de Vis, curator.
1905. Charles James Wild, acting-curator.
1911. Ronald Hamlyn Harris, director.
1917. Heber A. Longman, director.

The *Western Australian Museum* originated as a geological museum which C. G. Nicolay founded in order to house collections made by Frank Gregory and others. In 1889 it was transferred from the old guard-room at Fremantle, where Nicolay had placed it, to the office of the government geologist in Perth, a collection

made by B. H. Woodward was added, and Woodward himself was made curator in 1891. In 1892 the collections of the Swan River Mechanics' Institute were taken over, and the museum was thenceforth known as the Perth Museum. In 1895 it was transferred from the control of the department of lands to the care of a committee of which Sir James Lee Steere was chairman, and new buildings were commenced; in 1897 the name 'Western Australian Museum' was formally adopted, and an art gallery was added. In 1911 by the passing of an act it became incorporated with the public library as part of the 'Public Library, Museum, and Art Gallery of Western Australia.'

The first museum in Tasmania was the *Franklin Museum*, founded in 1842 by Sir John and Lady Franklin: the building was placed on a 10-acre block in Kangaroo valley, three miles north of Hobart. The museum was supported out of Lady Franklin's Ancanthe estate, the revenues of which were otherwise devoted to educational purposes. Sir John Franklin entrusted it to the care of the Tasmanian Society (see SOCIETIES, LEARNED), choosing its trustees from that body and giving the members special privileges. When the Tasmanian Society was absorbed by the Royal Society of Tasmania, the museum seems to have fallen into disrepair; in 1853 its cases and fittings were bought by the Royal Society for its own museum, its library was dispersed, and its collections (of which no details are known) probably went along with the fittings. Its first and only committee of management comprised Bishop Nixon, J. E. Bicheno, the colonial secretary, J. P. Gell, Ronald Gunn, and T. J. Ewing. The building is still in existence, but is unused.

In 1843 was founded the Royal Society of Tasmania, the formation of a museum and library being one of its avowed objects. Mention is made of a museum in the report for 1844, and in that for 1845 it was proposed to locate exhibits in the secretary's cottage in the government domain. From 1848 to 1852 they were housed in a committee-room of the legislative building, and in 1852 were moved to leased premises in Harrington-street. After prolonged negotiations with the government, during which four sites were offered and withdrawn, the society obtained in 1860 a site at the corner of Argyle- and Macquarie-street, on which the nucleus of the present building was at once erected; it was opened as *The Royal Society's Museum* on 29 January 1863. In 1885 important alterations were made: the museum (along with the botanical gardens) was handed over by the society to a board of trustees appointed by the government, its name was changed to *The Tasmanian Museum*, and in 1886 the building was enlarged, as it was again in 1901. The custodians of the museum since its establishment in Harrington-street have been:—

1862. Thomas Robin, curator.
1883. Alexander Morton, curator.
1908. Robert Hall, curator.
1912. T. Thompson Flynn, honorary curator.
1913. G. H. Hurlstone Hardy, assistant-curator.
1918. Clive Lord, assistant-curator.
1920. Clive Lord, curator.
1923. Clive Lord, director.

Musgrave, SIR ANTHONY (1828-1888), born in 1828 at Antigua in the West Indies, and educated at the local grammar school, was in 1850-1 private secretary to the governor of the Leeward Islands, in 1851 entered as a law student in the Inner Temple (but was never called to the bar), in 1852 was appointed treasury accountant of Antigua, and became colonial secretary there in February 1854. In 1860 he was promoted administrator of Nevis (one of the Leeward Islands), and in April 1861 was transferred to administer St. Vincent, becoming its lieutenant-governor in May 1862. From April 1864 to June 1869 he was governor of Newfoundland, in June was appointed governor of British Columbia, held the post till 1871 (when British Columbia was absorbed in the Dominion of Canada), and from May 1872 to June 1873 was lieutenant-governor of Natal. He was then appointed governor of South Australia, taking up office on 9 June 1873. Many important measures were passed during his rule, including the measures initiated by James Boucaut (q.v.), which enabled the government to borrow largely for the development of the colony's resources. On 29 January 1877 he left the colony, and from 1877 to 1883 was captain-general and governor-in-chief of Jamaica. In 1883 he returned to Australia as governor of Queensland, taking office on 6 November. He died at Brisbane on 8 October 1888, from an attack of apoplexy. (C.M.G., 1871; K.C.M.G., 1875.)

Music is a department of artistic activity in which Australia has shown a peculiar interest and bids fair to take at least its full place in the world. Whether the reason be the climate and the livelier and more expansive temperament encouraged by it, or merely the social conditions, the fact itself can hardly be denied that the Australians are a 'musical people.' Whether in the formation and progress of their own musical societies and orchestras, or in the crowded welcomes offered to visiting artistes and choirs, they display a zest which contains nothing of the factitious. Such visitors, including the greatest, have frequently attested their appreciation of this substantial recognition by repeating their visits, in spite of the distance to be travelled and the loss of time incurred. The placing of great, and even sumptuous, organs in town halls, and the provision of recitals (gratis) for citizens, are another indication of the same spirit. Whatever else the climate may do, it certainly tends to produce vocalists, and native-born singers—to name here only Dame Nellie Melba and Ada Crossley—have won an international distinction. Though the country is still too young to have produced composers of great note, there is much promise in this respect also, and it may be anticipated that Percy Grainger (for example) is but a forerunner of a list of musical creators. Meanwhile education in music is assiduously cultivated, from the state schools upwards. Apart from plenteous private instruction, Australia has two university chairs of music (Melbourne and Adelaide), and three conservatoria of a public character (Sydney, Melbourne, and Adelaide). Musical examinations and competitions are also established throughout the Commonwealth. The musical criticism of the press is competent and keen, and almost invariably frank and discriminating.

Musical Development.—The history of musical development in the several States has naturally been much the same, and it is scarcely possible to treat of one apart from the rest. The prominent practitioners of Australia have at all times travelled to and fro, and the visiting celebrities have made no other distinction than that of naturally choosing the greater centres of population. Necessarily, however, New South Wales secured a considerable start of the rest since the day when Surgeon Worgan of H.M.S. *Sirius* landed his piano on the shore of Port Jackson in 1788. It was, for example, not till 1836 that a similar

instrument was floated ashore through the surf of Holdfast Bay, South Australia, by Mrs. Hindmarsh, wife of the first governor. In that same year Vincent Wallace (q.v.) was already giving in Sydney a concert at which he produced his own compositions for violin and piano; his opera, *Maritana*, which he subsequently produced in London, is said to have been partly composed in Australia. Meanwhile in Hobart were the Deane family, whose head had been a player in the London Philharmonic Society. These came to Sydney in the same year (1836) and gave that city its first classical string quartet concerts. Two more generations of this gifted family were settled in Sydney; one of its members, Arthur Deane, became a leading baritone with the Carl Rosa company in England in the nineties. Vincent Wallace's sister, Mrs. Wallace Bushelle, after appearing in England in her brother's opera, returned to Sydney in 1864 and settled there as a teacher. Meanwhile in 1841 there had arrived the erudite Isaac Nathan (q.v.), who inaugurated oratorio in Australia at a sacred concert in St. Mary's Cathedral. Nathan has been called the 'father of music in Australia,' and for 23 years he exercised a refining influence upon that art in Sydney. It was also in 1841 that we hear of a public performance of a sacred concert in Adelaide; a choral society gave concerts there in 1848. By 1859 Carl Linger was conducting a Handel festival in that city; his merits as a musician are to be gathered from his 'Song of Australia,' the best composition of its kind that has yet been locally produced. A further token of rapid progress in the same State is to be found in a 16 weeks' season of grand opera in 1861, when Adelaide contained only 18,000 inhabitants. In Victoria the Melbourne Philharmonic Society was formed under John Russell in 1853. The (old) Sydney Philharmonic Society was founded in 1854, and for years justified its existence by such productions as the *Messiah*, *Creation*, and *Elijah*; Anna Bishop (wife of Sir Henry Bishop, the composer) appeared among its soloists. At a musical festival held in Sydney 19-23 July 1859 the *Messiah* was revived at the opening of the hall of the university; at this festival the French musician Lavenu conducted 250 voices and an orchestra of 70, the prominent vocalists being Rosina Carandini (soprano) and Sara Flower (contralto); Melbourne sent her leading soprano, Mrs. Tester. In 1870—the middle year of two decades during which Italian and English opera flourished in Australia as it has never done since—there took place at the university of Sydney a musical festival at which appeared as vocalists Lucia Barrati, Lucy Chambers (an Australian contralto from the lyric stage of Italy), Neri (tenor), Contini (baritone), and Dondi (basso). Musical associations under various names—sometimes with mergings and consequent changes of title—inevitably grew up throughout Australia (a list of those at present existing is given below). In Adelaide a Philharmonic Society was performing the *Messiah* in 1862. In 1885 was established the present Royal Philharmonic Society of Sydney, which opened under Max Vogrich with Schumann's *Paradise and the Peri*, with Alice Rees as soprano. Vogrich was a pianist and composer who had toured Australia with Wilhelmj; later he married Alice Rees, whose brilliant career in Berlin and America closed with her return to Melbourne after an absence of 40 years; he was succeeded as conductor by Henri Kowalski, at one time pianist to Napoleon III. At Kowa'ski's second concert—the Christmas performance of the *Messiah* in 1885—the soloists included Nellie Armstrong (to become celebrated under the name of Melba), Marie St. Clair, Frank Boyle, and F. J. Hallewell (formerly of York Minster). The great soprano, then in her twenties, showed a marvellous fluency in 'Rejoice Greatly.' Kowalski returned to Paris to produce his opera *Giles de Bretagne*, but revisited Sydney and remained there for some years. In 1887 Roberto Hazon, for five years conductor at the Teatro Dal Verme at Milan, arrived in Sydney with Simonsen's Italian Opera company. He opened his career with the Philharmonic Society in 1889 by directing a festival at the Exhibition Building (when Charles Santley starred in his great rôle of Elijah), and for nearly 20 years exercised a profound influence. Meanwhile, during the Melbourne Centennial Exhibition (1888), the Victorian government brought out Mr. (afterwards Sir) Frederick H. Cowen and a few leading artistes, and the Cowen orchestra of 70 or 80 players drew crowds in that city, as it did also on visiting Sydney. After Cowen's departure enthusiasts in Melbourne guaranteed £5000 for two years, the Victorian government £3000, and subscriptions amounting to £5000 a year followed. The selection of a conductor was unfortunately left to a London committee, who engaged Hamilton Clarke, of the Lyceum and Haymarket theatres. Severe losses ensued, and though Julius Herz, the experienced conductor of the Melbourne Liedertafel, was called in, the venture failed. In the meantime G. W. Marshall Hall had been appointed (1891) to the new chair of music at the Melbourne university, and in 1893 he formed a symphony orchestra of 60 players, which gave six concerts annually. In Sydney the Amateur Orchestral Society was founded by Hazon in 1892 and conducted by him till his return to Milan in 1907. The title, however, was a misnomer, since it included regular professional players and a number of professional teachers. Many fine concerts were given, and among artistes who played concertos in association with it were Paderewski and Teresa Carreno. Hazon was succeeded by Gustave Slapoffski, and the old society survived until in 1908 the Sydney Symphony Orchestra, with 70 professional players, was started under W. Arundel Orchard, with Henri Staell as leader. This orchestra gave excellent concerts until 1919, when Verbrugghen (to be mentioned later), backed by heavy government subsidies, formed the all-the-year-round New South Wales State Orchestra; but the annual cost of the latter until 1922 had been £20,000 and the annual deficit about £11,000, and, despite its brilliant work, the orchestra was disbanded. During the earlier part of the time so far summarily treated Adelaide had been developing. In 1867 a season of grand opera was conducted by Herr Siede; other seasons, with various entrepreneurs and artistes, followed regularly from 1871, the Italian season of 1874 being of special note. In 1880 was formed the Adelaide String Quartette Club, which flourished with useful influence for six seasons. In 1883 the university of Adelaide received from Sir Thomas Elder a benefaction for the establishment of a scholarship in music at the Royal College, London. A chair of music—the first in Australia—had already been decided upon, and in 1884 the governor, Sir William C. F. Robinson (himself something of a composer) raised a provisional sum of £3000 towards the stipend of a professor, subsequently made secure by Sir Thomas Elder's generous endowment of £20,000. The first occupant of

the chair was Joshua Ives, Mus. Bac.; the present professor is Dr Harold Davies, who also directs a university conservatorium.

Since 1872 Melbourne town hall had possessed a fine organ, with David Lee as its first organist; unfortunately this was ruined by fire on 2 February 1925. In Sydney the new town hall, seating 3300 people and a choir, was opened on 27 November 1889. The first soloist to raise his voice in it (three days later) was Charles Santley, and W. T. Best, from St. George's Hall, Liverpool, began a series of recitals upon an organ which was then the largest in the world. This architecturally beautiful instrument was built by Hill and Sons of London, and possesses 128 stops, five keyboards, and pedal. The first city organist was Auguste Wiegand, a brilliant exponent of the French school, who held the post till July 1900. His successor Arthur Mason, an Australian, performed 450 programmes of remarkable range and variety. Since 1910 the organist has been Ernest Truman, an Australian composer and instrumentalist trained at Leipzig. Visitors who have played upon this great instrument have been Alfred Hollins, the blind organist of Edinburgh, in 1904, and E. H. Lemare, of St. Margaret's, Westminster, in 1906. At Adelaide the town hall organ was opened in 1877 with a performance by David Lee from Melbourne.

Musical Societies.—Something has already been said of musical societies. The chief of those in existence are here enumerated, but though they may appear to be confined to the capital cities, there are meanwhile flourishing bodies in all the larger towns. In *New South Wales*: The Royal Sydney Apollo Club, formerly the Sydney Liedertafel (founded in 1881 and renamed in 1916, with successive conductors J. A. Edwards, Max Vogrich, J. A. Delany, W. Arundel Orchard, and Alfred Hill, a New Zealand composer); the Sydney Madrigal Society (founded in 1908, with present conductor Frederick Mewton, organist of St. Andrew's Cathedral); the Welsh Choral Society; the Sydney Orchestral Society; the Harmonic Choral Society; the Orpheum Amateur Orchestral Society; the British Musical Society. In *Victoria*: The Melbourne Philharmonic Society (founded under John Russell in 1853, with subsequent conductors C. E. Horsley, Elsasser, David Lee, George Peake, and Alberto Zelman); the Oriana Madrigal Society; the Orchestral League of Victoria; the Melbourne Symphony Orchestra; the University Symphony Orchestra; the Royal Victorian Liedertafel (conductor Ernest Wood), a combination of the previous Melbourne Liedertafel and Metropolitan Liedertafel; the British Musical Society. In *South Australia*: The South Australian Orchestra (conductor W. H. Foote); the Adelaide Bach Society (Dr. Harold Davies); the Royal Choral Society; the Adelaide Glee Club; the Orpheus Society. In *Queensland*: The Brisbane Musical Union (George Sampson); the Brisbane Apollo Club (formerly Liedertafel); the University Choral Society; the Brisbane Austral Choir; the Queensland State and Municipal Orchestra (George Sampson). In *Tasmania*: The Hobart Orpheus Club (founded in 1877, present conductor C. M. Foster); the Hobart Choral Society; the Hobart Amateur Orchestral Society. In *Western Australia*: The Metropolitan Gleemen of Western Australia (founded in 1901 as the Metropolitan Liedertafel; present conductor A. J. Leckie); the Metropolitan Orchestral Society (H. Vowles); the Maylands Orpheus Society; the Fremantle Orchestral Society.

Grand Opera.—The first performance of opera in Australia was that of Sir Henry Bishop's *Clari, the Maid of Milan*, in 1834. Ten years later Rossini's *Cenerentola* was staged in Sydney with Edith Wallace (later Mrs. Wallace Bushelle) in the name-part. All early performances of the pioneer days were imperfect, but a few of the names survive to lend a personal interest. The Mrs. Stirling who sang in Auber's *Fra Diavolo* in 1845, and who in 1849 appeared as Maritana, was the mother of Nellie Stewart (q.v.), and the Madame Carandini (q.v.) of that company founded a musical family which flourished for another half-century. Sara Flower sang contralto rôles from 1850. Catherine Hayes, a famous Dublin soprano, sang in opera (1854) with Emile Conlon, a French baritone, and toured with great success in concerts. The output of operas not then so familiar as now was prodigious in spite of difficult conditions. Anna Bishop, accompanied by the harpist Chevalier Bochsa (who died in Sydney) made a stay of two years (1855 to 1857) and was the first to sing in Australia soprano rôles in *Lucrezia Borgia* and *Linda di Chamounix*. During the next two years Carandini's company and the Bianchi troupe performed seven more Italian operas new to Australian audiences. William Saurin Lyster, whose portrait now hangs in the Melbourne Art Gallery, dominated opera in Melbourne and Sydney as an impresario of enthusiasm and talent for 20 years (1861-80). He opened in 1861 with Lucy Escott (of Drury Lane) in *Maritana*, and two years later staged *Les Huguenots* for weeks. The 'first time' features of the following year were *Faust* and *Le Prophète*. John Hill came from London as conductor in 1866, and ten years later married in Melbourne Ilma di Murska, a world-famous Austrian soprano. He directed the music of *Semiramide* and *L'Africaine*. Armes Beaumont became one of Lyster's tenors, and had a long career, chiefly in Melbourne, both in opera and in oratorio. Lyster's company sailed to San Francisco, and at the end of their season came back with several new artistes. The only one still remembered is Lucy Chambers, an Australian contralto who returned from Italy and seems to have made a lasting impression. In the early seventies *Attila, Iona, William Tell, Crispino e la Comare* (Ricci), *I Lombardi*, and *La Juive* formed 'first nights,' and to these were soon added *Lohengrin* and *Aida*, Zelman conducting both in 1877. Revisiting London in 1879, Lyster returned with new artistes for *Carmen*, and during the season of 1880 introduced Annis Montagu and Charles Turner.

Two favourite artistes in opera, Signor and Signora Coy (tenor and soprano), arrived in 1871 and settled in Melbourne for many years, and the maestro Zelman became the father of the present orchestral conductor there. Martin Simonsen at this time began his career as a manager with French opera bouffe, in which his wife Fannie Simonsen starred in *The Grand Duchess* and other pieces; in 1875 Alice May (afterwards popular at the London theatres) headed a company in which *Dinorah* was the novelty. Ilma di Murska was brought from San Francisco by Henry Mapleson in 1876. In 1881 the Montagu-Turner company began a career of some years with ballad operas in English and some of the old Italian and French works. It was Simonsen who introduced Signor Hazon

(conductor) and a strong company of Italian artistes, who opened in Melbourne in 1886. The dainty Rebottaro, lyric soprano, and the Spanish basso Tomaso de Alba both settled permanently in Australia. Ciuti, the dramatic soprano of this fine combination, was quoted in Italy for the largeness of a voice of rich quality which had made her famous; Australian audiences heard and admired, though she was then past her prime. Amy Sherwin, known as 'the Tasmanian nightingale,' sang in a season of English opera; in later years she toured the world as a concert soprano, settled in London and filled soprano rôles with the Carl Rosa company, and, after twice visiting Australia, eventually retired, and has for some years been teaching in London. She married Hugo Gorlitz, for some years concert-manager for Paderewski and Kubelik. Louise Lablache (contralto) and Dimitresco (tenor) were in Australia at this time, and when they joined with Lilian Tree (as Marguerite) and Buzzi (as Mephisto), the cast was considered perfect. Later the two first sang at Covent Garden. Lablache possessed a heavy voice of richly sombre quality, and was tragically impressive as Carmen. While *I Pagliacci* and *Cavalleria Rusticana* were still the rage as epoch-making novelties in Europe, Williamson and Musgrove staged both works in Australia with an Italian troupe headed by Del Torre, the Italian soprano who had created Nedda and Santuzza in England. Mascagni's *L'Amico Fritz* was also staged. There was a new Italian company in 1892, remembered for a rich-throated warbling soprano, Tancioni Cuttica, who drew great audiences.

Twenty years having passed without Wagnerian opera, in 1900-1 Musgrove, an enthusiast for music, engaged Gustave Slapoffski, leader and occasional conductor of the Carl Rosa company, to form a combination for *Tannhauser*, *Lohengrin*, and *The Flying Dutchman*, all of which were splendidly staged and performed. Slapoffski conducted (also John Crook), and Mme Slapoffski and Ella Russell were the principal sopranos in various casts composed almost wholly of artistes from the Carl Rosa company. An immense repertoire was presented, during which Agnes Janson appeared in her Covent Garden rôle as Carmen. In the same year Williamson gave great operatic seasons under Hazon, during which De Vere Sapio, the American soprano, delighted Australia, as did also Carlo Dani and Dalia Bassich in Puccini's *La Bohème*, Verdi's *Otello*, Ponchielli's *La Gioconda*, and Giordano's *Fedora*, which were all new to Australia. In all 169 performances were given in ten months in Sydney alone, when the population was only half a million. Orchestras of 40 players were provided, a fact which marked the modern era. That number has been since maintained.

In 1907 a complete German company was formed by Musgrove, and audiences received *The Valkyrie*, as well as early Wagner, with enthusiasm; Humperdinck's fairy opera *Hansel und Gretel* was another new and enchanting feature. *The Valkyrie*, with its double cast and scenic and orchestral demands, formed a memorable production, dominated by Heinze, a great dramatic mezzo, as Brünnhilde. The following year Musgrove revived opera in English at the Sydney Criterion, bringing out the English tenor Wilson Pembroke, and advancing the youthful Rosina Buckman to the rôle of Maritana. This new National Opera company was far from strong. The first production of *Madame Butterfly*, with Bel Sorel and Amy Castles alternately in the name-part, brought back Hazon from Milan to Australia in 1910. The new opera was staged nightly in the two great centres for five or six weeks at a time, and was taken to New Zealand. In 1911 Melba realized her ambition of heading a great combination in her native country. The diva sang all her favourite rôles (with John McCormack as Romeo to her Juliet). Another great event was the first stage production of *Samson and Delilah*, with Zeni as tenor and the Countess De Cisneros in the mezzo rôle. Scandiani, the baritone, was much admired; some years later he became director of Milan Opera House. The great Polish dramatic soprano Korolewicz-Wayda electrified Australia's audiences with her glorious voice as La Tosca to Scandiani's Scarpia, and as Aida. The party included Rosina Buckman and Nance Maher in secondary rôles. Late in 1910 the Quinlan Opera company began with an English provincial season, a year later sailed for the Cape, and after a tour there reached Melbourne and Sydney in 1912. As they carried an orchestra of 50 players, a triple cast, and a numerous chorus, their expenses were prodigious, the fares to Australia amounting to £16,000. The flower of English opera singers had been got together. Some of these may be named — Agnes Nicholls, Jeanne Brola, Lalla Miranda, Edna Thornton, John Coates, John Harrison, Robert Parker, Allan Hinckley, Charles Magrath. Miranda, a Melbourne soprano whose sister Beatrice was for several years (including 1925) principal soprano with the Carl Rosa company in England, varied her career in France with full seasons at Covent Garden. Julia Caroli (sister of Daisy Davies), a Sydney-born singer who returned from Italy, sang several soprano rôles with the company. The new operas were *Tales of Hoffmann*, *The Prodigal Son* (Debussy), *The Girl of the Golden West* (Puccini), and *Tristan and Isolde*. *The Valkyrie* and Wagner's early operas, with Verdi's *Aida* as part of their Italian repertoire, were also staged, and the season was one sustained triumph.

In 1913 Thomas Quinlan, under a guarantee of the necessary subscription for so vast an undertaking, arrived in Melbourne again with a reconstructed company of 170 persons, 22 of whom were principals. Mention may be made of Felice Lyne, Jeanne Brola, Perceval Allen, Gladys Ancrum (sopranos), Edna Thornton (contralto), Maurice D'Oisly (tenor), Robert Parker and Graham Marr (baritones), and William Anderson (basso). The director Tullio Voghera returned for the Italian works, but Richard Eckhold, a celebrity who was with Wagner at Bayreuth in 1875, directed all the German masterpieces. Both in Melbourne and Sydney the four works of *The Ring of the Nibelung* —*The Rhinegold*, *The Valkyrie*, *Siegfried*, and *The Twilight of the Gods* (*Gotterdammerung*) —were splendidly staged, and aroused a rapturous admiration. *The Mastersingers*, with Robert Parker as Hans Sachs, was also new, and the modern methods of Charpentier in *Louise* did not lessen the ready appreciation of the work.

The great war banished opera until the Gonsalez company reached Australia by way of the East in 1916 and revealed some fine voices in Capelli (tenor), Scamuzzi (baritone), and Cacialli (basso) during a successful season. In 1919 Frank Rigo organized a season in Melbourne, in which Gertrude Johnson (soprano), Balboni and Lois (tenors), and Fillipini (bari-

tone) made successes. The Williamson season in English during the same year brought forward Amy Castles, Nellie Leach, Elsie Treweek, Leah Myers, Balboni, Cacialli, Carl Formes, and Fred Collier.

Melba had promised to give Australia a second memorable season, and J. Nevin Tait, John Lemmone, and the diva formed in Italy a splendid combination which reached Melbourne in March 1924. Nearly a score of operas (excluding Wagner) were beautifully presented with Melba and Toti dal Monte as the star attractions. Giordano's striking tragedy of the French Revolution, *André Chénier*, was the one great novelty, and *Don Pasquale*, unheard for a generation, was also produced. Melba opened the Sydney season brilliantly on 21 June in *La Bohème* with Dino Borgioli, a distinguished Italian tenor of great charm, as Rodolfo, and Alfred O'Shea sang the rôle with Melba during the season. The chorus consisted of 30 Australian female voices and 24 Italian tenors and basses, with an orchestra of over 40 players.

Comic Opera. The domain of comic opera, musical comedy, and burlesque is too comprehensive to be treated both briefly and adequately, since the second and third of these divisions depend too much upon stage-glitter, dancing, and the farcical humour of the 'book.' By their tuneful music, often of a high order, and by their wit in the libretto, the comic operas of W. S. Gilbert and Arthur Sullivan are placed on a pedestal apart. In Australia, as in England, this series has been regularly revived to crowded audiences from 1879 to the present time. Two only, *Ruddigore* and *The Grand Duke*, have failed to reach Australia, and from all accounts 'they never will be missed.' An imperfect performance of *H.M.S. Pinafore* had been given by Kelly and Leon a little earlier, but the record of Gilbert and Sullivan production of a high standard began in 1879, when J. C. Williamson acquired the rights; the whole series thereafter fell to him in all the States. Rose Hersee (of the Carl Rosa company) was the first Josephine, with Armes Beaumont as Rackstraw, and Williamson as Sir Joseph Porter. In 1881 Williamson produced *The Pirates of Penzance*; his troupe included Verdi, a grand opera baritone, as the pirate king. Nellie Stewart (q.v.) as Patience, and Howard Vernon and Verdi as the rival poets, were in the production of the new work in 1883. In 1885 Nellie Stewart played Phyllis in *Iolanthe*, with Robert Brough as the Lord Chancellor, and Emma Temple as Celia. At Christmas 1886 *The Mikado* opened the new Princess Theatre, Melbourne, with Alfred Cellier as conductor, Howard Vernon as Ko-Ko, Nellie Stewart as Yum-Yum, Frank Boyle as Nanki-Poo, John Forde in the name-part, and Alice Barnett as Katisha (which part she had created at the Savoy). In 1887, Nellie Stewart appeared as Aline in *The Sorcerer*, with Frank Thornton as John Wellington Wells. In the same year *Princess Ida* brought Leonora Braham, a fine singer, in her original Savoy part as Ida. In 1889 the music of *The Yeoman of the Guard* provided more than one stately aria, and the pathetic shading in the character of the piece was much appreciated when it was presented with William Elton as Jack Point, Clarence Leumane as Colonel Fairfax, Howard Vernon as Shadbolt, Nellie Stewart as Elsie Maynard, and Fanny Liddiard as Phoebe Meryll. All the exuberant brightness of *The Gondoliers* was enjoyed in 1891 with a good cast, including Elton, Sydney Deane, Vernon, Charles Ryley, Florence Young, Flora Graupner, and Violet Varley—the last two being small persons with large voices. *Utopia Limited*, the only weak opera of the series, was staged in 1906. *Trial by Jury*, written earlier even than *Pinafore*, was not staged by the Royal Comic Opera company until 1893, when it was put on and followed by *The Vicar of Bray*.

It will be observed that all these pieces have since been revived every three years or so, with new casts reinforced when necessary by new principals from the D'Oyley Carte companies on tour or at the Savoy theatre. George Lauri, a great favourite for many years, and a highly trained dancer, played many of these characters admirably. Gladys Moncrieff, whose beautiful voice won her a triumph in *The Maid of the Mountains* and similar pieces, began her career in her part of Josephine. In 1926 she went to London and made a success in the name-part of *Rikitiki* at the Gaiety.

During Gilbert-Sullivan seasons up to the present day various conductors of note have directed the music. W. H. Harrison, Alfred Cellier, A. W. Juncker, Léon Caron, Harry Burton, and Slapoffski are among the best known. Cellier, after conducting his opera *Dorothy* (1886) for part of the run in London, directed it in Australia. Juncker, long resident in Australia, is a composer known for his opera *The Romance of Corsica*. He interpolated his song 'I was Dreaming' for Nellie Stewart in *Ma Mie Rosette* as applicable to the plot of that opera, and it became the rage throughout Australia. Caron was one of Lyster's conductors in 1880. This genial French artist was for many years with the Royal Comic Opera company until his death in 1905. Since 1904 Andrew MacCunn has conducted practically all the light operas by Lehar and Oscar Strauss, many musical comedies, and *The Beggar's Opera*.

Visiting Celebrities. As will have appeared from the preceding matter, Australia has been frequently visited by musicians of the very first rank, as well as by a host of others of more or less considerable standing, from Great Britain or elsewhere. Many of these have already been incidentally mentioned, and during the present century their number has been so great that the tabulation given below must suffice. For the years preceding 1900 there should be added, among singers, Carlotta Patti, the sister of Adelina (1880), and Kate Thayer (1881). In 1890 came Lilian Tree, Antonietta Link, and Mme Patey; in 1892 Foli, the world-famed basso, and Orlando Harley (American tenor); in 1893 Antoinette Sterling; in 1894 were grouped Clementine de Vere Sapio, Belle Cole, and Charles Magrath; in 1895 Alice Esty, Robert Cunningham (born at Hobart), and Alec Marsh—all from the Carl Rosa company—with Mme Enriquez, appeared in all the Australian centres; in 1896 Mme Steinhauer, a Danish soprano, arrived, and in the same year an English quartet consisting of Emma Thudicum, Marion Mackenzie, Edward Branscombe (Westminster Abbey), and Douglas Powell. The quartet at the Albani festival of Sydney in 1898 brought Albani, Sarah Berry, Orlando Harley, and William Paull (a Carl Rosa baritone). In 1900 Jessie King, an English mezzo-soprano of eminence, sang in Verdi's *Requiem* and Coleridge-Taylor's *Hiawatha's Wedding Feast*.

Of visiting instrumentalists for the same or an earlier period only bare mention can be made.

1. Ox-eye Herring (*Megalops cyprinoides*). One-sixth natural size.
2. Sergeant Baker (*Aulopus purpurissatus*). One-seventh natural size.
3. Freshwater Catfish (*Tandanus tandanus*). One-seventh natural size.
4. Nannygai (*Trachichthodes affinis*). One-fifth natural size.
5. Red Perch (*Caesioperca lepidoptera*). One-fourth natural size.
6. Banded Sea Perch (*Gilbertia annulata*). One-third natural size.
7. Murray Cod (*Oligorus macquariensis*). One-eighth natural size.
8. Golden Perch (*Plectroplites ambiguus*). One-sixth natural size.
9. Sand Whiting (*Sillago ciliata*). One-fifth natural size.
10. Tailor (*Pomatomus saltatrix*). One-sixth natural size.

The pioneer violinist to tour the country (including bush towns) was Miska Hauser in 1854; the first woman violinist to come from Europe for the same purpose was Jenny Claus (1872), a brilliant pupil of Vieuxtemps. Arabella Goddard, the pianist, arrived in 1873; Levy, the star cornet-player, in 1877, Camilla Urso, the Italian violinist, in 1879 (with Benno Schereck, subsequently of Melbourne, as pianist). In 1880 Henri Ketten and Henri Kowalski (French pianists) appeared; in 1881 Wilhelmj, the German violinist, soon followed by Remenji, the Hungarian; in 1885 John Kruse, a Melbourne violinist, returned to his native city after an absence of ten years. The visitors of the next decade included Madame Schiller (pianist); Sir Charles and Lady Halle (Mme Norman Néruda), who drew crowds throughout a prodigious tour; W. T. Best, the organist; Ovide Musin, the Belgian violinist; Mark Hambourg (1895), who made several subsequent tours with his brothers Jakoff (violin) and Mischa ('cello); Chevalier De Kontski, an octogenarian pianist said to be the last actually taught by Beethoven and of note for the popular piece *Le Réveil du Lion*. Elsie Stanley Hall (Australian pianist) returned from Berlin as the only British student who had won the Mendelssohn state prize there; in later life she taught the piano to the Princess of Wales at St. James's Palace.

Most of the stars who have visited Australia during the present century have been under the management of J. and N. Tait. John Lemmone directed the Paderewski recitals and all Melba's later concerts, including her Red Cross tour (by which enormous sums were raised), and her People's Concert season with the New South Wales State orchestra in Melbourne and Sydney; Una Bourne was the pianist. Fred Shipman brought over Mischa Elman (Russian violinist), Nordica, Dufault, and several other stars; Daniel Meyer brought Levitski and also D'Alvarez. In recent years E. J. Gravestock has become prominent as an entrepreneur, handling Buckman-D'Oisly, Gerardy, Lipkowska, Hackett, and Stella Power. The list of stars is as follows:

1901 and 1923. Jean Gerardy (Belgian 'cellist).

1903. Edward Lloyd (tenor); Mark and Boris Hambourg (pianist and 'cellist); the Westminster Abbey Glee Party (Edward Branscombe conductor); E. H. Lemare (English organist); Ada Crossley (Australian contralto), with Percy Grainger (Australian pianist).

1904. Ignace Jan Paderewski (Polish pianist); Alfred Hollins (blind organist); Watkin Mills (English basso) and party.

1905. The Parkina-Foldesy concert company, with Margaret Thomas.

1906. Andrew Black (English baritone); Blanche Arral (French prima donna).

1907. Teresa Carreno (pianist); Marie Hall (English violinist).

1907, 1914, 1921, and 1925-6. Clara Butt and Kennerley Rumford and party.

1907. Melba, with Una Bourne (Australian solo pianist), Andrew Black, John Lemmone, and Harold Whittle (Australian pianist).

1908. Jan Kubelik (Bohemian violinist); the Royal Welsh choir (W. Thomas conductor); Katherine Goodson (English pianist).

1908, 1914, 1917, and 1921. The Cherniavsky trio (violin, piano, and 'cello).

1909. Melba, in concerts with orchestra; Amy Castles (soprano) with Peter Dawson (bass), both being Australians returned from Europe.

1910. Emma Calvé (world-famous Carmen), with Signor Gasparri (Italian tenor) and Jaques Pintel (Russian pianist).

1911. Leonard Borwick (English pianist); the Sheffield choir (Henry Coward conductor); Ben Davies (English tenor), with Esta D'Argo (Australian soprano) and Edward Goll (Bohemian pianist).

1912. Eleanora Cisneros (American operatic mezzo), with Paul Dufault (French-Canadian tenor), James Liebling ('cellist), and Harold Whittle (Australian pianist); Louisa Kirkby-Lunn (Covent Garden contralto), with William Murdoch (Australian pianist from London); Thuness Koverich (Hungarian violinist), with Leah Myers (Australian soprano, who has since adopted the name of Leah Rusel Myre in Europe).

1913. Adelina Genée, with a Russian corps de ballet and Mlle Schemiz and M. Volinin, and orchestra conducted by C. J. M. Glaser; Walter H. Thorley (English pianist); Lillian Nordica (American dramatic soprano), with Paul Dufault (French-Canadian tenor); John McCormack (Irish tenor, naturalized American).

1914. Harold Bauer, German pianist; Mischa Elman (Russian violinist, since 1920 naturalized American), with Eva Gauthier (mezzo-soprano) and Percy Kahn (pianist-composer); Peter Dawson (Australian baritone); Paul Dufault (French-Canadian tenor), with Pauline Bindley (Australian soprano), Ernest Toy (Australian violinist), and Jaques Pintel (Russian pianist).

1915. Robert Parker (American operatic baritone), with Florence Scapini (violinist) and Harold Whittle (pianist); Amy Castles (Australian soprano), with John Amadio (flautist) and Bryce Carter ('cellist).

1916. Max Selinsky (Russian violinist); Alfred Mirovitsch (Russian pianist), with Michael Piastro (Russian violinist).

1919. Melba in concerts, prior to leaving for London.

1920. Benno Moiseiwitsch (Russian pianist), with Daisy Kennedy (Australian violinist), Hubert Eisdell (English lyric tenor) and Alma Garrett (contralto); Amy Evans (Welsh soprano), with Fraser Gange (Scotch basso).

1921. Jascha Heifetz (Russian violinist), with Samuel Chotzinoff (pianist); Mischa Levitski (Russian pianist); Melba, in concerts.

1922. Jascha Spivakovsky (Russian pianist); Melba, in concerts for the people, with Una Bourne, John Lemmone, and State Orchestra; the Sistine Choir of 60 male voices (Monsignor Rella conductor); Toscha Seidel (Russian violinist), with Frank Hutchens (Australian pianist); Melba (farewell); Marguerite D'Alvarez (contralto), with Oscar Wagner (American pianist); Rosina Buckman (Australian operatic soprano), with Maurice D'Oisly (tenor), Adelina Leon ('cellist), and Percy Kahn (pianist).

1922 and 1925. Paul Althouse (American tenor), with Arthur Middleton (baritone).

1923. Lydia Lipkowska (Russian soprano), with A. Sverjensky (pianist); the Westminster Glee Singers (Edward Branscombe conductor); Melba, in concert season, with Prince Obolensky (basso), John Lemmone (Australian flautist), and Lindley Evans (Australian pianist).

1924. Charles Hackett (American tenor), with Yovanovitch Bratza (Servian violinist); Mieczyslaw Munz (Polish pianist from America); Zachariwitsch (Russian violinist), with Cellini (English tenor) and Cimara (pianist); William Hughan (Scottish song entertainer); Paul Vinagradoff (Russian pianist); Amy and Eileen Castles (Australian operatic sopranos), with Signor Capelli (operatic tenor) and Alfred Bartlemann (Australian baritone).

1925. Amelita Galli-Curci (Italian soprano), with Homer Samuels (pianist) and Manuel Berenguer (flautist); Elsa Stralia (Australian dramatic soprano), with Bessie Griffiths (Australian 'cellist) and Arthur Jordan (English tenor); Fritz Kreisler (Austrian violinist), with Lamson (English pianist); Dorothy Helmrich (Australian soprano, after long absence in London); the Sistine soloists (eight) in opera selections.

1926. Marie Antoinette Aussenac (French pianist), with the Butt-Rumford company; Anna Pavlova (Russian dancer), with Laurent Novikoff, in Russian ballet, and with orchestra conducted by Lucien Wurmser; the Don Cossacks choir (Serge Jaroff conductor); Toti Dal Monte (Italian lyric soprano), with Auguste Benf (operatic baritone) and William James (Australian pianist back from London); Percy Grainger (Australian pianist, now a naturalized American); Wilhelm Backhaus (German pianist); Feodor Chaliapin (world-famous Russian operatic bass-baritone).

Visiting Choirs.—Notwithstanding the very high cost of transporting choirs from Europe, such enterprises have several times been carried out; in the case of the Quinlan operatic tour of 1913 both chorus and orchestra were imported. In 1902 Edward Branscombe brought the Scarlet Troubadours, and in 1900, 1904, and 1922 toured the world with the well-trained Westminster Glee Singers, who proved very popular with madrigals, old English glees, and sacred numbers. In 1911 Dr. Charles Harriss (Canadian) brought 200 singers selected from the Sheffield Choir, with Dr. Henry Coward at their head. Melbourne, Sydney, Brisbane, and Adelaide were visited. As an example of the operations of this choir, its work in Sydney may be recorded. The Sydney festival opened (13 June 1911) with the *Messiah,* the soloists being Jenny Taggart, Gertrude Lonsdale, Henry Turnpenny, and Robert Charlesworth. In all 10 concerts were given, at which were presented *The Dream of Gerontius, Pan* (a symphonic choric idyll by Charles Harriss), Parry's *Blest Pair of Syrens*; Beethoven's *Choral Symphony* with the Sydney Symphony Orchestra under Joseph Bradley; Bach's motet for double-chorus 'Sing Ye to the Lord' and Sullivan's *The Golden Legend,* under Dr. Coward; the *Elijah* by the Sheffield singers and the Sydney Philharmonic; a coronation concert of miscellaneous pieces, and an open-air coronation celebration in Martin-place (21 June). The Sistine Choir was brought out by E. J. and D. Carroll and opened in Melbourne (15 April 1922) under the baton of Monsignor Rella. The full choir of men and boys, 50 in all, wore their purple cassocks. The programme of liturgical music from Palestrina to Perozi was exquisitely rendered; 17 concerts followed, and a second long season some months later. The Sydney season drew crowds for 21 concerts. Later in the year the boy choristers returned to Rome; the tenors and basses remained for a time and with operatic programmes filled the largest halls. The Russian 'Don Cossacks,' under Serge Jaroff, came in 1926 and proved a most harmonious male-voice choir in Russian folk-melody and anthems; though there were some fine individual voices, their forte was essentially ensemble singing. The Fisk Jubilee Singers first toured Australia in 1887 and captivated audiences with the quaint charm of their 'Steal away to Jesus,' 'I'm rolling through an unfriendly world,' and the like. All the States were visited more than once.

Musical Training: Conservatoria.—The foundation of chairs of music in the universities of Adelaide and Melbourne has already been mentioned. In connection with each there has been established a conservatorium; the similar institution in Sydney is a 'State' conservatorium without relation to the university. Three years after his appointment to the chair in Melbourne Professor Marshall Hall formed (1894) and directed a conservatorium in conjunction with it—the first experiment of the kind in a British university. Upon his vacating the chair, he was succeeded in both functions by Franklin Peterson, who died in 1914. Marshall Hall was then reappointed, but he also died in 1915, and was succeeded by his chief subordinate, W. A. Laver, who held office till 1925. The present professor and director is Bernard Heinze, a former student of the conservatorium who has spent some years in England and on the continent of Europe. The principal teacher of singing is Agnes Janson, the famous Swedish Carmen. To Marshall Hall the musical world of Melbourne has reason to be grateful; his undoubted musicianship, his strong personality, and his unbounded energy and enthusiasm had a very pronounced influence on the musical development of the State. Professor Peterson, in his turn, played a great part in shaping the public examinations in music; to Professor Laver is largely due the creation of a sound school of pianoforte. Students below a certain standard are not accepted at the conservatorium, and the majority are engaged in following the full course for the diploma or degree. The degree of Mus. Bac. has been conferred on 45 students, and about 130 have taken the diploma. The great majority of these have subsequently taken up teaching work throughout Australia, and some have gone abroad and made their mark; among the latter may be named Florence Austral, Kate Samuels, Elise Nerida Steele, Anne Williams, Bernard Heinze (now the professor), Fred. Clutsam, and William James.

On leaving the university (1900) after his first tenure, Marshall Hall started an institution commonly known as the Albert Street Conservatorium, in which Melba interested herself, giving lessons in it to students of promise at times between her long absences in Europe and America. Since 1914 it has been under the direction of Fritz Bennicke Hart.

The Adelaide Conservatorium was established by the university in 1898, absorbing the staff of the Adelaide College of Music, which had flourished for many years under I. G. Reimann. The present director is Professor Harold Davies, with a staff of 19 teachers; the number of students is approximately 650.

The New South Wales State Conservatorium—which is a branch of the education department and is financed by an annual parliamentary appropriation, with its revenue from fees credited against such grant—was opened in 1916, with Henri Verbrugghen, a Belgian violinist long resident in Glasgow, as principal. With him he brought the three other players of his string quartet, Jenny Cullen, David E. Nichols, and James Messeas—a first-rate combination of many years' standing in Glasgow. (An already existing Austral Quartet of capable artists, headed by Cyril Monk, was thereby displaced; nevertheless fine concerts were given at the Beale salon by Henri Staell, W. J. Grieves, H. T. Kelly, and Bryce Carter.) Verbrugghen proved himself a brilliant orchestral conductor, formed a small choir for the study of Bach, and gave lectures. After his departure (1922) for America, where he was appointed conductor of the Minneapolis Orchestra, he was succeeded (1923) by W. Arundel Orchard, who gradually formed an orchestra partly composed of professional players but with an infusion of advanced students taking the work as part of the academic curriculum. There are at present over 1500 students on the conservatorium roll. The conservatorium is housed in a picturesque struc-

ture fashioned from what were once the stabling quarters of government house.

Examinations.—Various English bodies visit Australia to hold examinations in all branches of music. Most prominent among these are the Associated Board of the Royal Academy of Music and the Royal College of Music, which is a chartered institution, and Trinity College, which is affiliated with London university. These external agencies, however, have naturally been more and more replaced by arrangements within Australia itself.

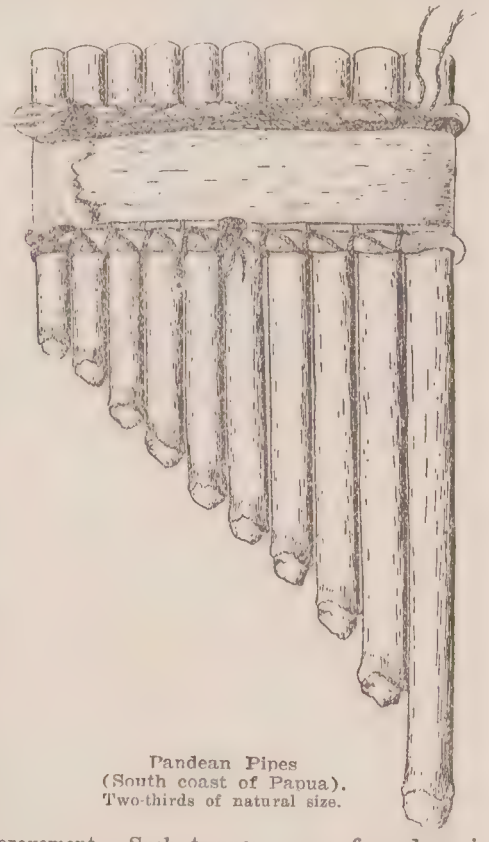
In 1887 the university of Adelaide inaugurated under the direction of its then professor, Joshua Ives, the first public examinations in music held in Australia. These were followed in 1902 by the university of Melbourne, which instituted similar tests conducted by a board under its authority. For the first examination, held in that year, there were 431 entries; an exhibition, providing three years' tuition at the University Conservatorium, was offered for competition. The scheme was almost immediately extended to Tasmania with the sanction of the university of that State. In 1906 the universities of Melbourne and Adelaide entered into an agreement for the joint conduct of a common scheme, and in this the universities of Tasmania and Queensland became partners in 1911, and the university of Western Australia in 1915. In 1917 Verbrugghen, of the New South Wales State Conservatorium, was so impressed with the results of the partnership that he obtained the consent of the education department to making the conservatorium also a sharer in the scheme, which thus became pan-Australian. A central board, known as the Australian Music Examination Board, was then established and in 1918 held its first meeting in Sydney. In 1925 the 'Art of Elocution' was added to the list of subjects, and in that year the aggregate of entries for examination in the whole of Australia was 14,369

Musical Competitions.—Competitions in music have been held for many years throughout all the States, probably the most important being the 'South Street, Ballarat' and the 'Australian Natives' Association,' both in Victoria. The former are on a very large scale and attract thousands of people to Ballarat every year. Many singers and instrumentalists owe their success to the encouragement received at these meetings, which set a useful standard.

Australians distinguished in Music.—Among Australians who have gained distinction in the art centres of the musical world are:—Dame Nellie Melba, Florence Austral, Frances Alda, Eda Bennie, Lucille Benstead, Pauline Bindley, Bertha Bird, Eugenie Boland, Una Bourne, Rosina Buckman, Julia Caroli, Amy, Dolly, and Eileen Castles, Ella Caspers, Hope Charteris, Ada Crossley, Esta D'Argo, Beatrice, Bessie, and Muriel Griffiths, Gertrude Johnson, Daisy Kennedy, Rene Maxwell, Myrtle Meggy, Lalla and Beatrice Miranda, Leah Myers, Eva Mylott, Marie Narelle, Stella Power, Kate Rooney, Bertha Rossow, Patti Russell, Frances Saville, Evelyn Scotney, Clara Serena, Amy Sherwin, Elise Steele, Elsa Stralia, Elsie Treweek, Gladys Verona, Strella Wilson; George Boyle, Fred Collier, Robert Cunningham, Peter Dawson, A. H. Gee, Reginald Gooud, Eric Hayne, Frank Hutchens, Walter Kirby, John Kruse, John Lemmone, Godfrey Ludlow, E. E. Mitchell, William Murdoch, Browning Mummery, Alfred O'Shea, Lempriere Pringle. Jan Rudenyi (Pechotsch), Walter Sherwin, Cecil L. Sherwood, Lawrence Godfrey Smith, Otto F. Sobell, Horace Stevens, and Ernest Toy.

Australian Composers include:—May Brahe, Mona McBurney, Roy Agnew, Arthur L. Benjamin, George F. Boyle, H. J. Brewster-Jones, George H. Clutsam, David John Coutts, Percy A. Grainger, Fritz B. Hart, Claude Haydon, Alfred Hill, Ernest Hutcheson, Herbert Howells, William G. James, Louis Lavater, G. W. L. Marshall Hall, W. Arundel Orchard, Henry Tate, and Ernest Truman.

Music, Aboriginal.—Among primitive peoples music developed as an accompaniment controlling and stimulating religious or ceremonial dances. In its earliest phases, it was therefore entirely rhythmic. Among the Australian natives the clapping of hands, or the striking of two boomerangs or sticks together, may be considered the most primitive methods of accompaniment for this purpose. An improvised drum in the shape of a skin stretched across the knees, and beaten with the fists, was a technical improvement. Such tympana were figured as in use at Port Jackson in 1798 (Collins), and were observed in Western Australia before 1839 (Ogle). Other time measurers are the carved leaf-shaped 'tatty sticks' and other staves beaten together, and the musical 'coondie,' a club with a serrated edge on which a boomerang is rasped up and down. The time-beating is usually performed by the women, who sit while the dances are in progress.



Pandean Pipes
(South coast of Papua).
Two-thirds of natural size.

Apart from these the aboriginal has shown little inventive genius in the manufacture of instruments of music proper. The 'bull-roarer' (see ABORIGINES) may perhaps be considered such. It is found over the greater portion of

Australia, and its counterpart is known from many lands. It would appear that the few instruments known, such as the corroboree-trumpet, or 'drone-pipe,' of the northern parts of the continent, the emu-decoy of western New South Wales, and the bone whistles of north-eastern Queensland, have the doubtful quality of producing but one note. The drone-pipe is made

Conch Trumpet (New Guinea).
About two-fifths of natural size.

either of bamboo with the internodes removed, or of a hollow sapling. Intonation, which is taught at the initiation ceremonies, is given by a vibratory movement of the lips. In Groote Eylandt such an instrument is part of the equipment of every camp, and the booming sound goes on throughout the night, one native relieving another. Its cessation would indicate that all the camp was asleep, and the opportunity might be seized by a hostile party. The bone whistles of Queensland resemble units of a pan-pipe, and are blown across in the same manner. Of later introduction are whistles, formed from a folded leaf, that of the cultivated lemon giving the best results.

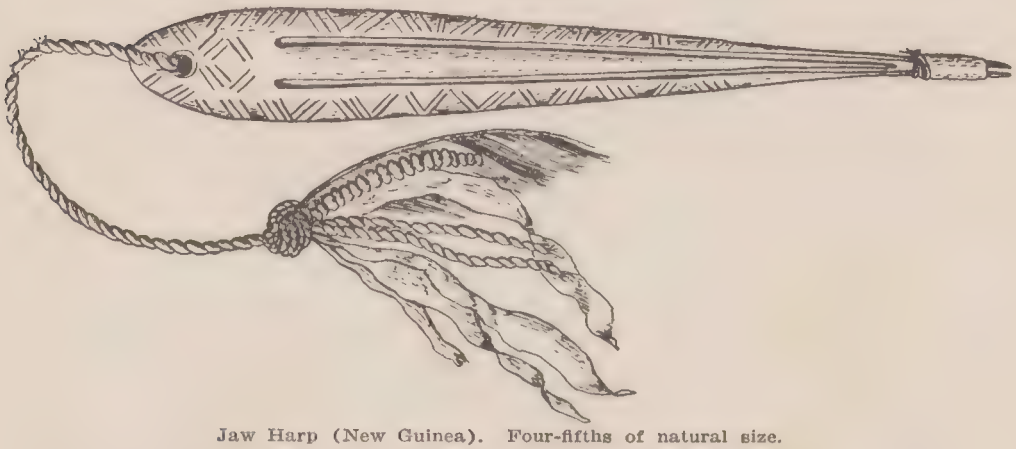
Vocal music, though largely indulged in, shows no advancement from the elemental. Most of it consists of a low monotonous chant, with very little range. Many natives can improvise, and a man often whiles away his time with compositions of his own on themes of personal interest. The vocal scores of some of the corroborees are transmitted from one tribe to another where not a word is understood. A new song is highly appreciated, and a travelled aboriginal sometimes brings back a few of the latest 'ditties,' with which he 'astonishes the natives.' In the corroboree songs (says Mathew) 'the modulation is easy and gradual, the music rising or falling in semitones, save when, after a gradual descent, there is a sudden vocal leap of an octave upwards. The close of the piece will be indicated by three great yells, which do duty for the crashing music indispensable to finish off most of the compositions in the repertoire of civilization.' Voice production of a novel kind is described by a native of Cairns, Queensland. A certain kind of small brown frog, carefully selected, is placed in a vessel containing a small amount of water, and is left until it dies and the liquid becomes discoloured with age. The black 'Caruso' then drinks the liquid, eats the frog, and thereby gains the much-desired clear strong voice.

The wail for the dead by the women at sunset —which can, indeed, hardly be called music— is pensive and melancholy in the extreme. It rises and falls uncannily on the still evening air, and, once heard, becomes indelibly impressed upon the memory.

See Basedow, *Australian Aboriginal* (Adelaide, 1925); Bonwick, *Daily Life of the Tasmanians* (London, 1898); Calvert, *Aborigines of Western Australia* (London, 1894); Collins, *Account of the English Colony in N.S.W.*, 2 vols. (London, 1798-1802); Dawson, *Australian Aborigines* (Melbourne, 1881); Fraser, *Aborigines of N.S.W.* (Sydney, 1892); Mathew, *Eaglehawk and Crow* (London, 1899); Ogle, *Colony of W.A.* (London, 1839); Ridley, *Kamilaroi and other Languages* (Sydney, 1875); H. Ling Roth, *Aborigines of Tasmania* (London, 1890); W. Roth, *Ethnological Studies* (Brisbane, 1897); and *North Queensland Ethnography* (Brisbane, 1902); Smith, *Booandik Tribe of the S.A. Aborigines* (Adelaide, 1880); Smyth, *Aborigines of Victoria*, 2 vols. (Melbourne, 1878); Spencer, *Report on the Horn Expedition*, part iv, Anthropology (London, 1897); Spencer and Gillen, *Native Tribes of Central Australia* (London, 1899); and *Native Tribes of the Northern Territory* (London, 1914); Taplin, *Folk Lore*,

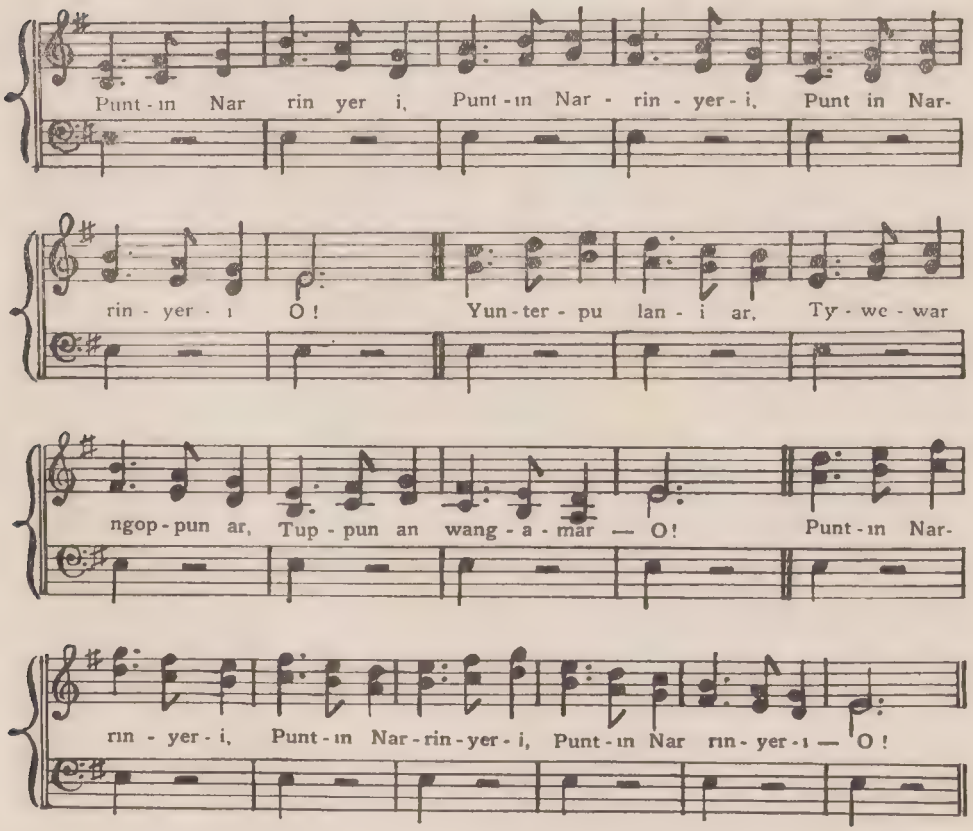
Music-sticks ('Iwompa'), Arunta Tribe, Charlotte Waters, Central Australia.
About one-third of natural size.

Drone Pipe ('Mamillami'), Northern Territory. One-seventh of natural size.



Jaw Harp (New Guinea). Four-fifths of natural size.

Vivace



Song used at a corroboree of the Narrinyeri tribe (1860).

Manners, Customs, etc. of the S.A. Aborigines (Adelaide, 1879); and *Native Tribes of S.A.* (Adelaide, 1879); Thomas, *Natives of Australia* (London, 1906). W.W.T.

Music, Papuan.—The music of New Guinea, whether instrumental or vocal, is more advanced than that of the Australian aborigines. The instruments employed are more various and show a much higher degree of culture. For rhythmic purposes the chief are drums and rattles. Drums are found in great variety. In some of the villages on the north-eastern coast there are communal drums, very massive and highly carved; cut from a solid log of hardwood and laboriously hollowed out through a longitudinal slit, they are used for signalling or sounding alarms, and are beaten with a pounder-like baton. The dance-drum (or 'tom-tom') is hollow, and of the 'hour-glass' type. In the Gulf of Papua the end opposite to the tympanum is carved to imitate the mouth of a crocodile. An exceedingly large bell-mouthed variety occurs among the Tugeri tribe, west of the Fly River. A small straight-sided instrument, resembling a miniature cannon, is made in the Trobriand group. The timpani are usually made of the skin of snake or lizard, but a wallaby pelt is sometimes used.

A rattle used at dances on the Fly River is formed of dangling seed-pods and crabs' claws attached to a bent cane. On the upper waters of the same river human skulls are used for the same purpose. After decapitation the skull is removed through a cut at the back, cleaned, and replaced in the skin, a small pebble being inserted in the brain-cavity before the final stitching. In the Torres Straits rattles made of seeds of the *Pangium edule*, fastened to a circular frame, form part of the initiation equipment, and in the same islands clappers of split bamboo are used for rain-making.

Among musical instruments proper the triton shell (or 'conch-trumpet') is known in New Guinea. The shell has a hole drilled in the spiral chamber, through which a deep whistling sound can be produced. Mouth whistling is also practised; one tribe, living in the hinterland of Redscar Bay, whistles the tribal melodies in chorus. Pandean pipes, known from the Sepik and Markham rivers, consist of only three or four modulated tubes, differing in this respect from the multiple pipes of the southern coast of Papua and Melanesia generally. The 'jews' harp' (or 'jaw harp,' to give the instrument its original New Guinea name) is considered a musical toy. Made of palm-wood or bamboo, slightly concave, it resembles an elongated pen-nib. Two strips represent the pen-point, these being tied together at the ends and enclosing a free and splinter-like 'tongue;' a cord is attached to the butt-end. The instrument is placed against the mouth, breathed upon, and kept in a state of vibration by a constant jerking of the cord. A single-string musical bow has been observed on the Sepik River, and a peculiar variety of bamboo drone-pipe on the Markham. This latter is not blown with the mouth, but struck on the knee, the percussion causing the cylinder to emit a booming noise. The 'bull-roarer' (see ABORIGINES) is known from several regions on the mainland, and also in the islands of Torres Straits; wherever found, it is associated with ceremonies, and venerated accordingly. Palm-wood is the material favoured in its manufacture, but a form in light wood from the upper Fly River is covered also with the skin and feathers of a bird of paradise.

Vocal music is largely indulged in, but in this connection S.H. Ray states:

I doubt whether it is possible to give a literal translation of any New Guinea song. A native would probably find it very difficult to express the meaning (if it were known to him) in the language of everyday life. All these songs naturally belong to the older stratum of the language. Associated with traditional customs, they have been accepted and used by succeeding generations without much enquiry into the meaning of the words used. The constant and rapid change usual in the language of savage races would soon cause many of the words to become obsolete, and in time their significance would be entirely forgotten. Many travellers in New Guinea have given specimens of songs, but all have failed to explain the language used.

Some of the vocal music consists of chants sung during ceremonies, and even when performing ordinary acts of life, such as planting and harvesting yams. As regards the quality of vocal performances in Papua R. A. Vivian records:

When performing (i.e. singing), the brown liedertafel has no conductor, but takes its cue from a recognized leader, and under him the body of singers was found to be as happy in its barbaric glees and madrigals as it was sympathetic in its folk songs, rhythmic in its hunting chorus, and defiant in songs of war. One of the numbers bore a striking resemblance to accompaniment by a bass violin, the effect being obtained by deep-throated humming at certain intervals in the song. Although harmony did not appear to receive any recognition, it occasionally obtruded itself, very likely by chance. Combined, the voices produced a rich volume of sound, unison at times being especially pleasing. Many of the melodies were of a composition far from simple. W.W.T.

Muskrat-kangaroo, vernacular name of a species (*Hypsiprymnodon moschatus*) of the marsupial family Macropodidae, which differs remarkably from other members of the family. The head and body together are about 10 inches long, the tail about 6½ inches. The fore- and hind-limbs are sub-equal, the latter not being specially developed—as are those of other members of the family—for bipedal leaping progress. The hind-limbs are also remarkable because the first toe (which in other Macropodidae is aborted) is well-developed though clawless, and can be opposed to the other toes, and the fourth toe does not greatly predominate in size over the others, as it does in kangaroos and wallabies. The tail is naked and scaly. The muskrat-kangaroo has been found hitherto only in the dense and damp scrubs of the Herbert River district of Queensland. Chiefly diurnal, it procures its food by turning over debris in search of insects, worms, and tuberous roots, and frequently eats palm-berries. The nest is round, and formed of leaves. W.A.H.

Foot of muskrat-kangaroo.

Musk Tree. See OLEARIA.

Musquito, an aboriginal belonging to the Broken Bay tribe in New South Wales, who

after long association with convicts was convicted of the brutal murder of an aboriginal woman and transported first to Norfolk Island and then (in 1813) to Tasmania. He was assigned as a servant to Kimberley of Antill Ponds, and transferred from him to Edward Lord, but became famous as a tracker and was employed by the police against the bushranging gangs. In October 1817 Governor Sorell stated that he was sending Musquito who had been 'extremely useful and well conducted' to Sydney in the *Jupiter*, and bespoke Macquarie's consideration for him on account of his services. If Musquito went to Sydney, however, it was not long before he returned to Hobart. In 1818 he was instrumental in tracking down Michael Howe (q.v.), but soon afterwards found himself in danger from convicts—and even from some prisoners used as police—who sympathized with Howe, and was sent to Hobart. Here, having no employment and no friends, he gathered round him a number of aboriginal refugees who had broken tribal laws, and formed them and other native ne'er-do-wells into a 'Tame Mob' which in 1819 began a series of attacks on white settlers. In 1820 the mob infested the Oatlands district, and next year moved eastwards to Oyster Bay, where Musquito obtained a great influence over the previously quiet Oyster Bay tribe. In this lies his importance—that he introduced among the shy and comparatively inoffensive Tasmanian natives the aggressiveness and ferocity of the mainland tribes; he also introduced the boomerang (which was not a Tasmanian weapon), but it does not seem that he persuaded his new companions to adopt it. It is fair to add that he is said to have persuaded the Oyster Bay tribe to indulge in a little rough farming, and that according to West Gilbert Robertson, who knew Musquito personally, regarded his misdoings as retaliation for previous ill-treatment. During 1820-23 the raids of his followers became so unbearable that great efforts were made to catch him, and in August 1824 a local aboriginal usually known as 'Tegg' or 'Teague' guided police to his lair, shot him in the thigh, and brought him to Hobart. On 1 December 1824 he was convicted of a murder committed at Grindstone Bay (south of Oyster Bay) in 1823, and on 25 January 1825 was hanged at the Cascades near Hobart. His example, unfortunately, was infectious. Tegg, failing to receive a promised reward at once, took to the bush with another aboriginal mob, and committed several atrocities, but after a time surrendered and was pardoned. One of Musquito's comrades, 'Black Tom,' was captured in 1823 and sent to Macquarie Harbour, but escaped and joined the 'Abyssinian mob' which infested the Shannon valley; he came in under a conciliatory offer made by Governor Arthur in 1828, and died at Emu Bay in 1832. It is usually stated that he was 'Black Tom Birch,' a native trained and much trusted by Thomas William Birch; but this is not so.

See Bonwick's *Last of the Tasmanians*, and West's *History of Tasmania*.

Mutton-birds. See PETRELS.

Myall. See ACACIA.

Mycetozoa or **Myxomycetes,** commonly known as slime-fungi, are minute organisms on the border between the animal and vegetable kingdoms, characterized by the constant sequence of three main stages in their life-history: (1) the firm-walled spore gives birth to a swarm-cell; (2) the swarm-cells coalesce to form a wandering plasmodium; (3) the plasmodium concentrates to form either sporangia enclosing numerous spores (Endosporeae), or sporophores with spores on their outer surface (Exosporeae). During the plasmodia stage they resemble low forms of animal life, as amoebae, but when mature they are very like fungi. From these, however, they are distinguished in that their vegetative body consists of naked protoplasm without a firm membrane: they lack the cellular mycelium of the true fungi.

Many species are commonly found in dense forests or damp gullies on decaying wood, leaves, manure or grass. The dense masses of spores are said to injure vegetation by a process of suffocation; and it is recorded that horses and other animals have died from the effects of eating these spore-masses adhering to pasture. *Physarum cinereum*, during damp, warm summer weather, occurs in patches of one to five feet in diameter on couch or buffalo grass in our suburban gardens, and on grass-lands throughout Australia. The cosmopolitan Flowers of Tan (*Fuligo septica*), which in the plasmodia stage somewhat resembles the broken yolk of an egg, spreads over tan-beds in hot-houses or frames. *Mucilago spongiosa*—well known as a cause of injury to hay-crops in other countries—has been occasionally collected in Australia. The disease known as club-root or finger-and-toe, amongst cabbages and turnips, is caused by *Plasmodiophora brassicae*. Another species (*Spongospora subterranea*) causes a disease in potatoes known as corky-scab. Closely related to these are the slime-moulds which cause the malaria that is transmitted by the mosquito to man (see TROPICAL MEDICINE), and the Texas fever that is transmitted by the tick to cattle (see CATTLE-TICK). The writer has received the plasmodium of *Lycogala epidendrum*, found in sawdust at Scheyville; mature specimens were collected from the Sydney botanic gardens, the National Park of New South Wales, and Russell Falls in Tasmania. Upwards of 50 genera and 400 species are known to science, of which some 27 genera and 82 species have been recorded from Australasia.

E.C.

Myoporaceae, a family of shrubs or small trees, mostly indigenous to Australia, containing a limited number of species that extend to Malaysia, Oceania, and tropical Africa. There is also a tropical American genus with one species. The flowers are axillary, irregular, solitary or in clusters of 2, 3, or more; calyx toothed or divided into 5 (rarely 4) segments; corolla with 4-5 lobes, more or less two-lipped; stamens usually 4, in pairs, inserted in the corolla-tube; fruit a drupe, dry or succulent; seeds solitary; leaves alternate, undivided. The most important genera are *Myoporum* and *Eremophila* (q.v.).

Myoporum, a genus of the family Myoporaceae, a few species of which are found in the Indian Archipelago and the Pacific islands, and one in tropical Africa; the rest are endemic in Australia. The flowers are small, usually white; calyx divided to the middle; corolla-tube usually bell-shaped, with 5 nearly equal lobes; fruit a more or less succulent drupe, *M. deserti* is the 'Ellangowan Poison-bush' of Queensland, and the 'Dogwood Poison-bush' of New South Wales; its poisonous properties are said to be more developed when the plant is in fruit. *M. platycarpum* (Dogwood or Sandalwood) is a medium-sized tree of the interior, regarded as a useful

stand-by for sheep in times of drought. It exudes a saccharine substance (manna) of pleasant taste, which is eagerly sought and eaten by the aborigines; they also use its resin as a substitute for pitch in cementing the fibres with which they join the stone heads of their tomahawks to the handle. The pleasantly perfumed timber, of a light walnut colour, is suitable for cabinet-work, having a fine mottled grain. *M. insu'are* (Cockatoo Bush), a coastal shrub, has edible berries of a slightly bitter flavour, much relished by birds, and a hard, durable white wood that has been used for inlaying. *M. debile*, a prostrate undershrub, has small bluish fruits with a bitter taste, which are eaten by the aborigines. *M. tenuifolium* (also known as Dogwood) has a soft, moderately light wood, which dresses well and is straight in the grain.

Myrsinaceae, a large family of trees or shrubs, widely distributed in tropical and subtropical regions. Five genera with 17 species are indigenous to Australia. The flowers are in small clusters; fruit a berry or drupe. *Rapanea variabilis*, found in the eastern States, is a small tree with very variable foliage, the lower (reversion) leaves sharply toothed, those on the upper branches entire. It has a hard, yellowish, durable wood with a grain reminding one somewhat of British oak. *Ardisia jambosa*, a very ornamental tropical tree of 30 feet, bears handsome crimson fruits of the size and shape of a cherry.

Myrtaceae, an important family of trees and shrubs, inhabiting warm and temperate climates, chiefly the former. With 42 genera and 816 species indigenous to Australia, it may be considered the second in size of Australian plant-families; but as it includes the eucalypts it is undoubtedly the first in importance. It comprises two well-marked sections (1) species with fleshy fruits, (2) species whose fruits are dry capsules. The former are widespread in tropical regions, and occur mainly in the warmer areas of Australia; the latter are typically Australian —among them are *Eucalyptus, Angophora, Tristania, Leptospermum, Melaleuca,* and *Callistemon.*

In Myrtaceae the calyx is divided into 5 lobes or teeth or reduced to a narrow border; petals 4-5, imbricate in bud; stamens usually numerous, in one to several series; filaments free, or united into a ring at the base, or in bundles; seeds few or solitary, rarely numerous and perfect; leaves opposite or alternate, simple, entire (rarely toothed), in many genera dotted with small, resinous glands, pellucid or black and superficial. Many species contain aromatic oils or kinos, or furnish useful timbers.

Agonis is an endemic genus of floriferous shrubs or medium-sized trees; *A. flexuosus*, a large shrub or small tree with willow-like leaves and branches, is an easily propagated ornamental shade-tree.

The endemic *Thryptomene* and *Micromyrtus* are chiefly heath-like shrubs with diminutive white, pink, or greenish flowers. A feature of the endemic *Calycothrix* is the elongated, prominently 10-ribbed, calyx-tube, with spreading lobes produced at the summit of their mid-rib into a long hair-like awn. *Rhodomyrtus macrocarpa* (Native Loquat) and *E. psidioides* have hard, tough timbers. The largely tropical *Rhodamnia* has 3 species, all found in eastern Australia; *R. trinervia*, with three-veined leaves characteristic of the genus, has a reddish-brown timber, moderately hard, firm and close-grained. Large trees are invariably hollow, and the timber is inclined to chip when dressed. The wood of *Xanthostemon pachyspermum* is gray to yellowish, tough, strong, and fine-grained.

See ANGOPHORA, BACKHOUSIA, BAECKEA, BARRINGTONIA, CALLISTEMON, CHAMAELAUCIUM, DARWINIA, EUCALYPTUS, EUGENIA, KUNZEA, LEPTOSPERMUM, MELALEUCA, MYRTUS, SYNCARPIA, TRISTANIA.

Myrtle, a name applied to many trees and shrubs of the family Myrtaceae (see ANGOPHORA, BACKHOUSIA, EUGENIA, MELALEUCA, MYRTUS) and, less justifiably, to some outside that family; thus the brush myrtle is a *Trochocarpa*, and *Nothofagus Cunninghami* is sometimes called 'myrtle beech,' or 'myrtle.'

Myrtus, a widespread genus of the family Myrtaceae, consisting of shrubs (rarely trees) with opposite, feather-veined leaves, commonly known as myrtles. All the species indigenous to Australia are endemic. The calyx-tube is bell-shaped, with 4-5 small lobes; petals 4-5; stamens free, numerous in several species; fruit an ovoid or globular berry. Most of the species are ornamental shrubs. *M. acmenioides*, the 'white myrtle' of the eastern scrubs, has a hard, tough, durable timber used by coach-builders.

N

Nail-tailed Wallaby, a genus (*Onychogale*) of the family Macropodidae, distinguished from *Macropus* (in which are comprised the ordinary kangaroos and wallabies) mainly by the presence at the end of the tail of a hard spur or 'nail' of unknown function. (The only other mammal in which such a peculiar structure is found is the lion, in which a similar hard body sometimes occurs.) Three species are known,

Bridled Nail-tailed Wallaby
(*Onychogale frenata*).

all confined to the Australian mainland, frequenting chiefly arid and rocky districts; all are small wallabies with a hairy muzzle, and a long tapering tail covered with short hair. The Bridled Nail-tailed Wallaby (*O. frenata*) occurs in the interior of Victoria, New South Wales, and southern Queensland. The head and body are about 22 inches long, the tail about 18 inches; the soft, thick fur is mainly gray, with white on the chin and chest, pale gray on the belly, and black in the middle of the back of the neck; there is a white stripe across the shoulder, continued along the sides of the back of the neck to near the ear. A second species is the Crescent Nail-tailed Wallaby (*O. lunata*) which now inhabits only a very restricted area in south-western Australia, being considered extinct in central and South Australia. The name is derived from the somewhat crescent-shaped white shoulder-stripe. The third species (*O. unguifera*) is confined to north-western and northern central Australia; it has the spur at the tail-end larger and more conspicuously developed than in the other two species. See MARSUPIALS.

W.A.H.

Nannygai (*Trachichthodes affinis*), a fish of ancient lineage which occurs in moderately deep water on the south-eastern coasts of Australia. It is deep pink in colour, shot with iridescent metallic tints which render it a wonderful object when freshly captured. It has been considered by some authorities to be identical with a fossil genus known as *Hoplopteryx* from the Cretaceous beds of Europe. Four recent species are known from Australian and New Zealand waters, and one from South Africa. Of these, one is the Red Snapper (*T. gerrardi*) of South Australian markets and another the Swallow-tail (*T. lineata*), which, together with the nannygai, are excellent food-fishes. A related genus (*Beryx*) is restricted to deeper water, and is widely distributed. *B. decadactylus* and *B. splendens* were first discovered in the depths surrounding Madeira, where they are known to the fishermen as 'alfonsino;' they have since been trawled in various parts of the Indian and Pacific oceans, and specimens of both species were secured by the Commonwealth trawler *Endeavour* off the coast of Victoria.

A.R.McC.

Nardoo, the aboriginal name for the sporecases (sporocarps) of a small plant, *Marsilea Drummondi*, a mud-loving or aquatic fern with a creeping underground stem. The leaves, when in bud, are curled up as young fronds usually are; when unrolled, they show a leaf-blade orbicular in outline and divided into four segments in the form of a cross, somewhat like the four-leaved clover. The plant has therefore been

Marsilea.

sometimes called 'clover-fern.' Starchy matter is enclosed in a case (sporocarpium), usually borne on a stalk rising from the underground stem. In summer the swamps in which it abounds dry up, and the plants wither away, leaving the fruit-cases on the ground; these are collected by the aborigines, ground between two stones, and made into a paste for use as a food

—but it contains little nutritive matter, is liberally mixed with finely-ground stone, and must be difficult to digest.

Just before the fatal close of the Burke and Wills expedition those explorers were reduced to a diet consisting wholly of nardoo, (as Wills himself calls it); the word belongs to the language of a tribe in the Lake Eyre district. From time to time it has been stated that nardoo is the product of leguminous or other seeds, including grasses; but this was based on the reports of non-botanical travellers more or less ignorant of aboriginal languages. The evidence was exhaustively dealt with by Sir Baldwin Spencer in the *Victorian Naturalist* for 1915; he remarks, 'The name Nardoo is applied to this plant (*Marsilea*) and its product only. There is no real evidence of its ever having been applied by the natives to any other plant or product.'

Nathan, Isaac (1790-1864), born at Canterbury in Kent, England, in 1790; studied Hebrew, German, and Chaldean at Cambridge under Professor Lyon as a preparation for the Jewish priesthood. In his leisure he practised the violin, and showed so great an aptitude for music that his parents allowed him to pursue the study of it under Domenico Corri, an Italian composer and teacher. After eight months he published his first song, 'Infant Love.' About 1813 Douglas Kinnaird introduced him to Lord Byron, who wrote his 'Hebrew Melodies' for Nathan to set to music. The first edition, which appeared in 1815, included several of the favourite airs sung in Jewish religious ceremonies. His intimacy with Lord Byron was interrupted only by the poet's death. For a later edition the 'Melodies' were revised in collaboration with Braham. His debts forced him to leave London for the west of England and Wales, but in 1816 he was persuaded to return and retrieve his fortune on the stage. He appeared at Covent Garden as Henry Bertram in Bishop's opera, 'Guy Mannering,' but his voice was too weak and its compass too small. In 1818 he published a song, 'God Save the Regent,' following it up with a number of operas, pantomimes, and melodramas, some of which were staged at Covent Garden and Drury Lane theatres. In 1823 he published *Musingia Vocalis, an Essay on the History and Theory of Music,* which he dedicated to George IV—at this time he was musical librarian to that King, and instructor to the Princess Charlotte.

On 7 July 1823 he produced at the Haymarket theatre a musical comedy, *Sweethearts and Wives,* which contained two of his most popular songs, 'Why are you wandering here?' and 'I'll not be a maiden forsaken.' At the same theatre on 10 August 1824 a comic opera, *The Alcaid, or the Secrets of Office,* was successfully staged, and in October 1827 a musical farce, *The Illustrious Stranger, or Married and Buried.*

In the musical catalogue of the British Museum no fewer than 12 pages are occupied by his musical compositions and literary works. His best-known literary works are *Fugitive Pieces and Reminiscences of Lord Byron* (1829) and *The Life of Madame Malibran de Beriot* (1836). In 1841, failing to obtain £2000 from the government (on account, he asserted, of work done and money expended in the service of the Crown), he migrated to Australia, where he performed a signal service in developing musical talent and improving music in the churches and choral societies. In 1841 he gave a sacred concert (which included some of his own compositions and works of Handel, Mozart, and Haydn) in St. Mary's cathedral at Sydney; this realized a large sum for the church. On 27 May 1842 he gave a madrigal concert in the hall of what is now the Sydney grammar school. In 1846 he published simultaneously in Sydney and London his *Southern Euphrosyne and Australian Miscellany,* which included examples of aboriginal melodies put into modern rhythm and harmonized as solos, quartets, etc. He also delivered many lectures on music; three given at the Sydney College were published in 1846. On 3 May 1847 Nathan produced at the Victoria Theatre, Sydney, his *Don Juan of Austria,* the first opera written, composed, and produced in Australia. On 15 January 1864 he was killed while alighting from the old Pitt-street horse-tramway.

See Bertie's *Isaac Nathan* (Sydney, 1922).

J.V.C.-B.

Nathan, Sir Matthew, born on 3 January 1862, educated at the Royal Military Academy, Woolwich (senior under-officer and Pollock gold medallist), entered the royal engineers in 1880 (lieutenant, 1880; captain, 1889; major, 1898; brevet lieutenant-colonel, 1907; colonel, 1914; lieutenant-colonel, retired, 1919). Appointed to the fortifications branch of the war office, he designed fortifications at Sierra Leone; served in the Nile expedition in 1885; constructed fortifications at Sierra Leone (1885-7) and in India (1887-90). In 1889 he served in the Lushai expedition; at the war office (1891-1900); was secretary to the colonial defence committee (1895-1900); governor of Sierra Leone (1900-3), Hong Kong (1903-7), and Natal (1907-9). On his return to England he became secretary to the post-office (1909-11), chairman of the board of inland revenue and member of the Pacific cable board (1911-14), and under-secretary to the lord lieutenant of Ireland (1914-16). After the Dublin riots of Easter 1916, he returned to military duty and was employed in the defence of London and as secretary to the pensions department and chairman of the special grants committee. Appointed governor of Queensland, he arrived in Brisbane in December 1920.

During his term of office he travelled through every part of the State. He was chancellor of the university of Queensland; president of the Royal Geographical Society of Australasia (Queensland branch); patron of the Historical Society of Queensland, and of the Brisbane Dickens Fellowship; chairman of the Great Barrier Reef committee, and of the Queensland Place Names committee. In scientific and agricultural matters he was no mere theorist, and his experience in so many avenues of service in different parts of the world was invaluable to Queensland. His departure for England in 1925 was marked by many public expressions of regret. (C.M.G., 1899; K.C.M.G., 1902; G.C.M.G., 1908; P.C. (Ireland) 1914). F.W.S.C.-S.

Native. This word is often prefixed to names properly belonging to European plants. The following list of Australian plants usually so distinguished does not pretend to be exhaustive. The native cherry, native currant, native grape, and native tamarind are dealt with separately.

Native Agrimony	see Acaena.
Native Aster	see Olearia.
Native Bird's-foot Trefoil	see Lotus.
Native Camphor Laurel	see Cinnamomum.
Native Carrot	see Daucus and Geranium.
Native Cascarilla	see Croton.

Native Centaury	see GENTIANACEAE.
Native Cranberry	see LISSANTHE and ASTROLOMA.
Native Dog-rose	see BAUERA.
Native Fuchsia	see EPACRIS, CORREA and EREMOPHILA.
Native Holly	see LOMATIA and OXYLOBIUM.
Native Ivy	see POLYGONACEAE.
Native Kumquat	see EREMOCITRUS.
Native Lavender	see HELICHRYSUM.
Native Lime	see CITRUS.
Native Loquat	see MYRTACEAE.
Native Mulberry	see PIPTURUS and MONIMIACEAE.
Native Nectarine and Peach	see OWENIA.
Native Olive	see OLEACEAE.
Native Pear	see XYLOMELUM.
Native Pepper	see PIPERACEAE.
Native Pomegranate	see CAPPARIS.
Native Poplar	see HOMALANTHUS.
Native Quince	see PETALOSTIGMA.
Native Rose	see BORONIA.
Native Sarsaparilla	see SMILAX.
Native Scrub Lime	see CARISSA.
Native Teak	see FLINDERSIA.
Native Tobacco	see NICOTIANA.
Native Willow	see ACACIA.

Native Bear. See KOALA.

Native Cats, the vernacular name of a genus (*Dasyurus*) of polyprotodont marsupials belonging to the family Dasyuridae, which includes also the banded anteater, pouched mouse, Tasmanian wolf, and Tasmanian devil; these forms are discussed under their own names. Of *Dasyurus* five species are recognized, four being residents of Australia (two of which occur in Tasmania), and the fifth (*D. albopunctatus*) occurring in north-western Papua. They are slender-bodied animals, rather like civets; the fore-limb digits are sub-equal, with sharp-pointed claws, but the first toe of the hind-limb is either very small or altogether absent. The pouch of the female opens vertically downwards, and contains six or eight teats. All the species have white spots distributed over the gray or black surface of the fur. The most widely distributed species is the Common Native Cat (*D. viverrinus*), which occurs in New South Wales, Victoria, South Australia, and Tasmania; its head and body together are about 18 inches long, and the tail about 12 inches. The thick, soft fur is either gray or black, with the usual white spots. The Black-tailed Native Cat (*D. geoffroyi*) is also widely distributed, being found all over the mainland of Australia, except in the extreme north and the eastern coastal districts. It differs from *D. viverrinus* in having the tail black at the end and along the greater part of the under-side, and in the presence of a distinct first toe. The Tiger-cat or Spotted-tailed Native Cat (*D. maculatus*) of southern Queensland, New South Wales, and Victoria, is larger, the head and body being about 25 inches long and the tail about 19 inches. The white spots extend to the tail, and there is a distinct first toe. The North-Australian Native Cat (*D. hallucatus*) is smaller than any of the others, and is confined to the tropics. A sixth species from the Bellenden Ker Range in northern Queensland, was described by Ramsay in 1888, as the Slender Native Cat (*D. gracilis*); it is a small species with a spotted tail, allied to *D. maculatus*, and is apparently a distinct form.

All native cats, so far as is known, have similar habits. All are arboreal, but the spotted-tailed species more completely so than *D. viverrinus*, which is not a very expert climber. Birds and birds' eggs, with an occasional small mammal, are sought after as food; but insects and reptiles are not altogether despised, and species living near the seashore feed largely on dead fish or other animals thrown up by the sea. In districts where they are numerous they do great damage in poultry-runs. See MARSUPIALS and NOXIOUS ANIMALS. W.A.H.

Native Cherry, the popular name of *Exocarpus cupressiformis*, a species of the family Santalaceae. It is a small tree (or large shrub) resembling the European cypress, ranging from Queensland to Western Australia. The diminutive flowers are arranged in clusters on short spikes; the fruit—very few of which mature—is a globular nut seated on a short stalk; this stalk enlarges, turns red, and becomes edible, thus giving rise to the popular

Native Cherry.

fancy that it is a sort of cherry with the stone outside. The leaves are reduced to minute scales. The bark yields a percentage of tannic acid. The close-grained, handsome wood is used for gun-stocks, tool-handles, and furniture, and by the aborigines of the Yarra valley for spear-throwers. Being a parasite on larger trees, it is difficult to propagate.

Native Companion, a very large bird, *Antigone rubicunda*,—often known by the aboriginal name 'brolga'—the sole Australian member of the crane family (Gruidae). Native companions are found throughout northern and eastern Australia, but are rapidly becoming scarce in the settled areas of the south-east and do not occur in Tasmania. They are stately birds of a light gray colour, having long legs, neck, and bill, with a red patch on the back of the head; they feed on lizards, insects, roots

and bulbs. They associate in small flocks and, like other cranes, perform curious dances, spreading the wings and bowing to one another. They are also very powerful fliers, ascending to great heights in the air. The female, without constructing any nest, lays two cream-coloured, slightly spotted eggs on the ground or on a tussock in a swamp.

Native Companion (*length* 42 *in.*).

In northern Queensland the aborigines of the districts which these birds frequent have introduced into corroborees dances imitative of their movements. Such a dance, performed on Dunk Island by aborigines from Princess Charlotte Bay, is described by E. J. Banfield in his *Confessions of a Beachcomber.* W.B.A.

Native Currant, a name commonly applied to *Leptomeria acida,* a species of the family Santalaceae. It is an erect broom-like shrub with angular branches, whose minute, scale-like leaves fall off before the flowers appear. The flowers are small, with a narrow tube and hooded lobes with reflexed tips, crowded in short spikes ½-¾ inch long; fruit a globular, edible berry, very like the common white currant, having a pleasant sub-acid flavour, and used for jellies and preserves. It is found in Victoria, New South Wales, and Queensland.

Native Grape, the popular name for several species of *Vitis* (q.v.) which bear small edible fruits with a remote resemblance in taste and appearance to the grape of commerce. *V. hypoglauca,* a tendril-climber with glossy leaves divided into 5 leaflets, has black fruit as large as small cherries, which might be greatly improved by cultivation; it extends from Victoria to Queensland. If the stem of this vine is cut almost through, and another incision made about three feet higher up, water exudes drop by drop and will soon fill a small cup. J. C. Bidwill (q.v.) saved his life when lost in the bush by procuring water in this fashion.

Native Hens. See RAILS.

Native Tamarind, the popular name for *Diploglottis Cunninghami,* the only species of a genus of the family Sapindaceae, which is endemic in Australia. It is a tall, slender bush tree, ranging from southern Illawarra into Queensland. The leaves have 10-12 leaflets, up to 1 foot long, covered with a velvety coat of rust-coloured hairs; fruit a globular fleshy capsule, the seeds embedded in an amber-coloured pulp (arillus) which has a pleasant, somewhat acid flavour and may be made into a palatable jelly. The wood is white and close-grained.

Naturalists' Societies. See SOCIETIES, LEARNED.

Naturalization. Under an imperial act of 1847, revised and enlarged in 1870, colonial legislatures were empowered to issue certificates of naturalization valid within the limits of their jurisdiction. Under this authority the Australian colonies passed laws providing for the naturalization of duly qualified aliens, the qualifications varying at different times and in different colonies. In Victoria, Western Australia, and Tasmania it was, by the end of the century, competent for any resident alien of good repute to present a memorial (signed by himself and verified upon oath) stating his name, age, birthplace, residence, occupation, and length of residence in the colony, and his desire to settle therein, together with all other grounds on which he sought to obtain the rights of naturalization—whereupon the governor might, if he saw fit, issue a certificate. In New South Wales a residence of five years in the colony, and in South Australia of six months, was required before naturalization could be effected. In Queensland no African or Asiatic alien was competent to apply unless he had resided in the colony three years, was married, and had his wife living with him; if these conditions were satisfied, a certificate might be issued which would entitle the applicant to all the privileges of citizenship except that of entering parliament. Any person presenting a certificate of naturalization obtained in another British possession was not required to show length of residence in any of the colonies, provided that he satisfied the governor of the colony in which he sought naturalization that the certificate had been obtained without fraud, and that he was the person named therein. No Chinese was competent to obtain a certificate of naturalization in New South Wales, Victoria, Queensland, or Western Australia.

In addition to their local laws the colonies were to some extent subject to imperial legislation. An imperial act of 1870 fixed the nationality of the wife by that of the husband, determined the status of minors throughout the Empire, and made provision for the renunciation of British nationality. Moreover it was generally accepted, though never actually determined, that an alien naturalized in Great Britain was naturalized throughout the Empire.

Naturalization was one of the subjects which must obviously, when federation came about, be placed under the jurisdiction of the Commonwealth. This was provided for in the constitution, but the federal parliament did not take action in this regard until 1903. By the

naturalization act of that year, which came into force on 1 January 1904, it was provided that all persons naturalized under state acts before that date were automatically naturalized under the new act. A certificate of naturalization thus carried with it within the limits of the Commonwealth all the rights, privileges and obligations of a natural-born British subject—except that, where by any Commonwealth or state constitution or act a distinction was made between natural-born British subjects and naturalized persons, such distinction should hold good in the case of all persons naturalized under the federal act. The qualifications required of a person applying for naturalization were that he must not be an aboriginal native of Asia, Africa, or the islands of the Pacific (except New Zealand); must intend to settle in the Commonwealth; must either hold a certificate of naturalization obtained in Great Britain or have resided in Australia continuously for two years preceding naturalization; if not already naturalized in Great Britain, must furnish a statutory declaration of name, date and place of birth, occupation, residence, length of residence in Australia and intention to settle therein, together with a certificate (signed by a justice of the peace, postmaster, teacher of a state school, or officer of police) that the applicant was known to him and was of good repute. Provision was also made for naturalization by marriage and by residence with naturalized parents.

In 1917, at the height of the war-fever, the act was amended, mainly to deal with such questions of dual nationality as arose out of the German 'Delbrück' act of 1913. No certificate of naturalization was henceforth to be issued unless the applicant first renounced his own nationality. He was, moreover, required to advertise his intention, in order to afford opportunities for a protest against his naturalization; he must also be able to read and write English. Further, the governor-general was empowered to revoke a certificate of naturalization if he saw fit; previously this had been possible only where the certificate had been obtained by fraud. This drastic provision was modified in 1920, revocation after that date being allowed only for specified reasons and after a judicial inquiry; it was further provided that the wife and the children under age remained British subjects when the husband's certificate was revoked unless the governor-general declared otherwise or they themselves made a declaration of alienage.

At the colonial conference of 1907 (see IMPERIAL CONFERENCES) the British home secretary drew attention to two anomalies regarding naturalization which had for a long time caused 'irritation and inconvenience' both in the dominions and the mother country. In the first place a certificate of naturalization could not be granted to a person in Great Britain if he intended to settle in the dominions, nor did residence in the dominions—or even naturalization in the dominions—serve to shorten the five years' residence qualification required for naturalization in Great Britain. In the second place, naturalization in a dominion was valid only in that dominion; e.g. a person naturalized in Australia was an alien in Great Britain, however responsible his position in the former country might be. (It should be noted, however, that a person so naturalized was 'as a matter of courtesy' given the assistance of British representatives in foreign countries.) To meet this position the home secretary proposed that residence qualifications throughout the Empire should be made uniform and placed on an Imperial basis; e.g. instead of five years' residence in Great Britain five years' residence within the Empire should be required, of which only the last year need be spent in Great Britain. The home secretary also proposed that certificates issued in one part of the Empire should be made valid throughout the Empire, so that an Australian certificate would effect naturalization both in Great Britain and in the other dominions. It was made clear, however, that these proposals, if adopted, would not impair the rights of the dominions to restrict the immigration of British subjects. At the conference of 1911 a compromise was agreed upon to meet dominion susceptibilities; the British government was to pass an act embodying the home secretary's proposals, but this would not bind the dominions unless they adopted it by local legislation. Accordingly a British nationality and status of aliens act was passed in 1914 by the British parliament, Australia coming into line with its nationality act, No. 48 of 1920. The most important provision of this act was the adoption of Part II of the British act, which conferred on any person naturalized under the act the rights of a British subject not only in the Commonwealth but also in Great Britain and in any other parts of the Empire which had also adopted Part II of the British act. It should be noted that under the new act Australian residence qualifications became in some respects more stringent, the former condition of two years' residence in Australia becoming five years' residence within the Empire during the last eight years before application, of which the year immediately preceding application must be spent continuously in Australia. To make our legislation conform better with that of Great Britain, the racial discrimination against the naturalization of natives of Asia, Africa, etc., was dropped. This was not an important amendment, as it did not affect the immigration acts.

To qualify for naturalization under this act and regulations made thereunder (S.R. 1921, No. 22) the applicant must furnish a statutory declaration showing his name, age, birthplace, residence and occupation, residence in Australia continuously during the past year, previous residence within the Empire for at least four years out of the last eight years before the application, and intention to settle in the Empire. He must also furnish current newspapers containing an advertisement of his intention to seek naturalization; certificates of character from three natural-born British subjects, two of whom must be householders, and the third a justice of the peace, postmaster, state-school teacher, or police officer; and satisfactory evidence that he has an adequate knowledge of the English language. Any person may make a statutory declaration with regard to such an applicant, the contents of which will not be disclosed except with the consent of the person making it—except for the purpose of a prosecution for forgery. The governor-general-in-council may without assigning any reason grant or withhold a certificate, as he thinks most conducive to the public good; but no such certificate will be issued until the applicant has produced a certificate from a justice of the high court of Australia, state judge, or magistrate, stating that he has renounced allegiance to the country of which he was a subject at the

time of his application, and that he has taken the necessary oath of allegiance. Residence conditions do not apply to a British-born woman whose marriage to an alien has been dissolved, or to the British-born wife of an alien who during marriage becomes an alien enemy. No fee is charged for the certificate of naturalization. Provision is also made under the act for naturalization by marriage, and by inclusion in a parent's certificate. The governor-general may in his absolute discretion in a special case grant a certificate of naturalization to any minor, whether or not the conditions required by the act have been complied with. Provision is made to enable a person by a declaration of alienage to discard British nationality in favour of a foreign nationality to which he is also subject from birth. The act is administered by the home and territories department, the governor-general being authorized to make any necessary regulations. From 1904 to 30 June 1926 31,971 certificates of naturalization were granted within the Commonwealth.

Status of Aliens.—Aliens and coloured persons, irrespective of nationality, suffer certain disabilities by or under the authority of federal and state legislation. No alien can exercise the federal franchise or hold a seat in the federal parliament; a similar disability exists also, with unimportant modifications, in the various states. No aboriginal native of Australia, Asia (except British India), Africa, or the islands of the Pacific (except New Zealand) may vote at federal elections unless he is enfranchised in respect to the more numerous house of a state parliament. In Victoria no male adult native of China or its dependencies or of any islands in the Chinese seas (unless born of British parents), and no person born of Chinese parents, unless a British subject, may vote at a parliamentary election. In Queensland naturalized Asiatics and Africans are disqualified as voters or members, and Australian aboriginals may not be enrolled as voters. In Western Australia no aboriginal native of Australia, Asia, or Africa, or person of the half-blood, may be registered as an elector for the council (except in respect of a freehold qualification) or for the assembly. In New South Wales, Queensland and Western Australia aliens are debarred from voting at or standing for municipal elections; in Victoria this restriction is limited to male adult natives of China or its dependencies or of any island in the Chinese seas (unless born of British parents) and to alien children of Chinese parents. In the Commonwealth and New South Wales aliens may be appointed to the public service only with the special permission of the governor-general or governor-in-council; in Western Australia they are debarred. In New South Wales, Victoria, and Tasmania restrictions are imposed on aliens in respect to service on juries.

Aliens also suffer disabilities as regards the acquisition of land. In New South Wales an alien must reside a year in the state before being qualified to apply for an original homestead selection, an original purchase-lease, or a settlement-lease, and must become naturalized within five years, otherwise any land so acquired will be forfeited; an alien may become the holder of a homestead farm, a crown lease, a suburban holding or a lease within an irrigation area, but will forfeit his tenure together with all improvements if he fails to become naturalized within three years; alien applicants under the closer settlement act must be subjects of Allied powers—or men who, though subjects of a neutral power, served with the British forces during the war—and must become naturalized within two years of the application. In Queensland no lease of land exceeding five acres in extent may be granted to any alien who has not first obtained in the prescribed manner a certificate that he is able to read and write a passage from dictation in such language as the secretary for public lands directs; by regulation, however, the attorney-general is authorized to grant exemptions in specified cases. An alien must obtain a similar certificate before acquiring a selection or an interest in a selection, and to hold it permanently must apply for naturalization within five years. In South Australia, Asiatic aliens are disqualified from obtaining leases of land in irrigation areas. In Western Australia regulations under the land act prescribe that no lease shall be acquired by an Asiatic or African alien, except of lands open for cultivation which are situated northward of latitude 25° S.

In Queensland, Western Australia, and the Northern Territory there are restrictions on the acquisition or use of miners' rights. In Queensland no Asiatic, African, or Polynesian alien may exercise any privilege under a miner's right except that of alluvial gold-mining on goldfields upon which any Asiatic or African alien was, at the commencement of the act, permitted to mine for gold. In Western Australia no Asiatic or African alien, and no person of Asiatic or African race claiming to be a British subject, may obtain a miner's right without the authority of the minister; no Asiatic or African alien may hold a mining lease. In the Northern Territory a miner's right held by an Asiatic alien entitles him to mine only for gold or tin on alluvial ground; no mining lease may be granted to an Asiatic alien, and no alien is entitled to acquire or hold any lease or any interest therein.

Certain classes of aliens are subjected to other disabilities also in connection with employment and occupation. The best-known example of this results from the definition of 'factory' in the state factory acts, which brings under the regulations any establishment in which one or more Chinese are employed. This was adopted in all the states chiefly as a result of agitation against Chinese 'cheap labour' in the furniture trades. In Queensland, moreover, furniture made by Chinese workmen or on the premises of any Chinese employer must be stamped with the words 'Chinese labour.' In Western Australia no Asiatic may be registered as the owner or occupier of, or be employed in, a factory unless he satisfies the minister that he carried on business in the factory or was employed therein before November 1903.

Among other occupational disabilities may be noted the prohibition in Western Australia and Victoria against aliens holding liquor licences; the refusal to aliens of pilotage exemption certificates under the Commonwealth law, or under the laws of New South Wales, Victoria, and South Australia; and the restrictions on the issue to aliens (especially to Asiatic aliens) of licences connected with the pearling industry in Queensland, Western Australia, and the Northern Territory. Further, aliens not resident in British dominions are prohibited from fishing in Western Australian waters; and the employment of persons of non-European descent in the cultivation of sugar-cane or works connected therewith in Queensland was prohibited by an award of the state court of industrial arbitra-

tion in June 1919, except on farms owned by persons of the same race as the employees. Aliens may not acquire shares in any company incorporated in the Commonwealth without the consent of the Commonwealth treasurer.

Aliens and Asiatics, irrespective of nationality, born outside Australia are ineligible for old-age and invalid pensions; in deference to Indian opinion expressed at intercolonial and imperial conferences, however, the Commonwealth government has agreed to bring down legislation to permit British Indians, otherwise qualified, to enjoy these benefits.

Federal legislation deals specifically with the registration of foreign companies, and to a certain extent restricts the field of their activities and those of companies with foreign shareholders. Thus firms with alien members may not be registered in the Northern Territory without the consent of the administrator; any company in which more than one-third of the shares are held by aliens is prohibited from acquiring any mine or carrying on any mining or metallurgical business without the consent in writing of the federal treasurer; in the Northern Territory mineral-oil licences and leases may not be granted to or held by any company other than a British company in which at least two-thirds of the shares are held by natural-born or naturalized British subjects. In Western Australia mineral-oil licences and leases may be granted only to British companies. Companies under contract with the Commonwealth government for the carriage of mails may employ only white labour in connection with their carriage. Ships in receipt of subsidies or bonuses from foreign governments are debarred from engaging in coasting trade, including trade between the Commonwealth and the Territories, including New Guinea.

In most if not all cases of disability against aliens, treaty-rights are respected.

Nauru, a small coral island situated about 26 miles south of the equator in longitude 166° east, has an area of about 5400 acres, four-fifths of which carry phosphates; the deposits, which have been estimated at 112,000,000 tons and contain from 85 to 88 per cent of tribasic phosphate of lime, occur in a central plateau, bordered by a narrow strip of fertile land whereon live most of the natives. In December 1925 the native population was 1239. Though the island was discovered in 1798 by Captain Fearn in the *Hunter*, and annexed by Germany as one of the Marshall group in 1888, it was not until 1900 that its phosphatic deposits were known to exist. In 1905 the German government granted to a German company a 94 years' concession to exploit the phosphates; in 1906, with the consent of the German government, this concession was sold to a British company (reconstructed as the Pacific Phosphate Company), which worked similar deposits on Ocean Island (British). This company held a monopoly until 1920.

In November 1914 Nauru was occupied by Australian military forces, who remained in control until civil administration was substituted in 1921, the council of the League of Nations having in the previous December formally allotted to the British Empire a 'C' mandate for the island. The terms of this mandate are unusual. Other British mandates of the C class specify the dominion which is to administer them (e.g. the mandate for the former German possessions in New Guinea was conferred on 'His Britannic Majesty to be exercised on his behalf by the Government of the Commonwealth of Australia'), but the mandate for Nauru does not specify the administering government. This was due chiefly to the conflicting interests of Australia and New Zealand in the phosphate-output. In July 1919, 17 months before the formal issue of the mandate, Britain, Australia, and New Zealand had made an agreement (confirmed on behalf of Australia by the Nauru Island agreement act of 1919), which provided for the appointment of an administrator for the first five years by Australia and thereafter as should be decided upon by the three governments concerned. They also agreed to purchase from the Pacific Phosphate Co. its interests in Nauru, as well as its plant on that island and on Ocean Island. In June 1920 this purchase was effected for £3,500,000, of which Britain and Australia contributed £1,470,000 each, and New Zealand £560,000. Control of the phosphates is vested in three British commissioners representing the three governments, each of which has a claim on the annual output (for home consumption only) in the ratio of their respective contributions to the original purchase. The price is fixed by the commissioners 'on a basis which will cover working expenses, cost of management, contribution to administrative expenses, interest of capital, a sinking-fund for the redemption of capital and for other purposes unanimously agreed on by the commissioners and other charges.' When the requirements of the three partners are satisfied, the surplus is sold abroad at market prices. During 1925 215,837 tons of phosphate were exported from Nauru, of which 141,217 tons went to Australia and 74,620 to New Zealand, the total value being £323,755. The deposits are worked by indentured labourers from China (obtained through the Hong Kong government) and a few from the Pacific islands; these are repatriated as their final contracts expire. In December 1925 there were on the island 124 Europeans, 827 Chinese and 10 Kanakas.

The first administrator, appointed by the Commonwealth, took over his duties in June 1921; he exercises administrative, legislative, and judicial powers—subject to the approval of the governor-general of the Commonwealth—and is assisted by an advisory committee of two Europeans and two Nauruans. All expenses of administration are met from local revenue; this amounted in 1924 to £18,200, of which £6689 was paid as royalty by the commissioners. In 1922 international attention was directed to Nauru owing to the apprehension felt by the permanent mandates commission of the League of Nations (which under the terms of the mandate receives an annual report from the Commonwealth) that native interests were being neglected. The Australian high commissioner, however, pointed out to the mandates commission that the authority of the British phosphate commissioners was limited by the administrator's ordinances, which took into account the interests both of the natives and of the indentured labourers. No further objections have been raised.

See the *British Year-Book of International Law* (1923-24), and Commonwealth Parliamentary Paper No. 41, 1923.

Nautilus. See MOLLUSCA.

Naval Defence. The history of the naval defence of Australia comprises three epochs—the purely British epoch, ending with the naval agreement of 1887; the epoch of auxiliary squadrons and subsidies, ending with the de-

fence conference of 1909 (see IMPERIAL CONFERENCES); and the establishment of an Australian squadron as a separate but integral part of the Imperial navy.

First Period.—In the early days of settlement, when there was little commerce to protect, and the utmost danger to be feared was the arrival of one or two enemy frigates in Australian waters to annex lands not yet formally taken over by England, the naval defence of Port Jackson was considered to be amply secured by the presence of a 20-gun ship of 500-600 tons and a small tender mounting six 3-pounders. Even these ships were not always available. Governor Phillip in 1791 declared that the colony ought always to have two ships at its disposal, but this was rather for obtaining supplies from oversea than for protection; in response to his appeal the admiralty sent out H.M.Ss. *Reliance* and *Supply*, and the colonial office shipped the frame of a schooner of 41 tons burthen, which in 1793 was launched in Sydney and named the *Francis*. The first armed vessel belonging to the colony was the *Cumberland*, a 28-ton schooner launched in 1801, but she was armed only 'for pursuing deserters.' For effective defence, reliance could be placed on nothing less than a British warship, and in the middle of the French wars the admiralty had none to spare. Among the visiting warships of those years—besides the *Sirius*, *Reliance*, and *Supply*—were the *Buffalo* (1799-1806), *Porpoise* (1798-1803), *Lady Nelson* (1800 until 1810, when Bligh dismantled her), and a second *Porpoise* (1800-1810). By Macquarie's time the eastern seas were free of French ships, and defence seemed unnecessary; he therefore on 8 March 1810 recommended that no warship be kept on the station, as two small brigs (of 200 and 150 tons respectively) could perform at less expense all the surveying and fetch-and-carrying needed for the colony. Accordingly the colonial office sent out the *Kangaroo* in 1814 and the *Emu* in 1815; it took a year to discover that the *Kangaroo* was unfit for her work, but the *Emu*, which arrived in Port Jackson on 12 March, was condemned before 24 June. In 1821, when Governor Brisbane was about to leave England for Australia, the British cabinet decided—for reasons not given—that in future a warship should be regularly stationed on the coast of New South Wales. From this decision developed the Pacific squadron of the Imperial navy, 'off the coast of New South Wales' being at an early date accepted in a very liberal sense. In 1824 Brisbane urged that 'two vessels should be sent out, commanded by a lieutenant or other naval officer, for the service of the Colony,' with a smaller vessel for Tasmania. Lord Bathurst replied that vessels for such service should be built at Sydney, demurely adding that if Sydney was not capable of building them, Hobart might be asked to do so. For many years no further action was taken in regard to naval defence in the Pacific, the admitted naval supremacy of Britain being considered sufficient protection for her most isolated colonies. In the forties Australian waters were still part of the East Indies station, and the exact date of the creation of the Australian station is to this day a matter of controversy. By some authorities it has been assigned to 1859, when Commodore Loring hoisted his broad pennant as commanding on the Australian station. But an earlier date is probable, since in 1848 the *Shipping Gazette and Sydney General Trade List* twice referred to the admiralty's decision to make Sydney the headquarters of a new station, and there is extant a letter from Colonel Baddeley of the royal engineers addressed on 11 May 1850 to 'Captain Erskine, Senior Naval Officer, Australian Station.'

The Pacific could not always remain tranquil under the shadow of a far distant Britain. So long as potential enemies were equally far away, there was nothing to fear. But in the early fifties relations between Britain and Russia were strained, and Russia had harbours and warships in the northern Pacific; the Australian colonists took alarm, and set about making provision for their own defence. At that time there were in Australian waters six ships of the royal navy—the *Calliope* (26 guns), an old sailing frigate; the *Herald* (8), a brig; the *Electra* (14), a third-class sloop; the *Fantome* (12), a fourth-class sloop; the *Acheron* (5), a small paddle-wheeled steamer; and the *Torch* (9), a similar vessel. This squadron was hardly capable of repelling an attack by such Russian ships as were then believed to be at large in the Pacific—an 80-gun battleship and four 60-gun frigates at Valparaiso, and 14 more frigates at Vladivostock. It was, of course, quite impossible to improvise an adequate defence against vessels of that size and number, but the Sydney authorities did what they could; they sent a gun to South Head (it is still there, near the signal-station), put Lieutenant Fayrer of the *Herald* in command of the pilot-boats at Watson's Bay, and shortly afterwards sent the *Acheron* as guardship to the Heads: 'she was fitted,' says a contemporary account, 'with seven paddle-wheel box boats—two with 12-pound field-pieces, four with 32-pounders, and one with a light 12-pounder.' Her officers were taken from H.M.S. *Calliope*, and her crew was composed of volunteers, with ten experienced seamen to teach them. In May 1854 the departure of four Russian warships from Manila was interpreted as a menace to our trade with China; the authorities were spurred to greater efforts, and in 1855 the *Spitfire*, the first war-vessel built in the colony, was launched at Cuthbert's yard on Port Jackson. She was a vessel of 60 tons, 51 feet on the keel and 61 feet over all, with a draught of 5 ft. 6 in.; her armament consisted of a long 32-pounder gun mounted on a traversing carriage. She was not a formidable craft; but, whatever was expected of her, her actual work was purely peaceful. No Russian ships arrived, and she was first used as a government craft for visiting lighthouses, and later became a coaster carrying produce from the rivers and small ports. In the meantime Victoria, in whose ports ships of the British navy were seldom seen, had taken independent action. Late in 1853 Commander W. N. Lockyer, who had resided in Victoria for some time, was sent to England to superintend the building of an armed steamer for the defence of Port Phillip, and on 31 May 1856 the sloop *Victoria* arrived in Hobson's Bay with Captain W. H. Norman in command. She was a twin-screw steamer of 580 tons, and developed 150 horse-power; she was pierced for six guns, but carried only two 32-pounders and one 68-pounder. Her personnel consisted of 8 officers and 150 men of all ratings. Her actual work was chiefly surveying, but she did good service off the New Zealand coast during the Maori war. In 1856 experiments were made with a new type of harbour-defence craft; two flat-bottomed boats of colonial hardwood were secured together and covered over, so as to afford a working platform 46 feet long by 28 feet

broad; the armament consisted of one smooth-bore 68-pounder gun. This vessel never passed the experimental stage—it simply disappeared, and no record of its service or its breaking-up is to be found.

During the civil war in the United States, the ships of both the Federals and the Confederates scoured the seas, each in search of armed vessels and traders belonging to the other side. Some of these visited Australian ports; the most notorious, the *Shenandoah*, a warship belonging to the Confederate States, put in to Port Phillip and docked at Williamstown. During her stay her captain committed a breach of neutrality by enlisting volunteers for her crew and then clearing out without the usual formalities. It was felt that the presence of an efficient warship would have prevented these occurrences, and in 1867 Sir George Verdon, the Victorian treasurer, while on a visit to England, obtained £100,000 towards the cost of the *Cerberus*, an ironclad for harbour defence purposes, and the gift of the *Nelson*, an old man-of-war which at the time of her launching in 1814 had been the largest ship ever built in England. She was originally a 120-gun three-decker, but after 40 years of peace was cut down to a 72-gun two-decker and given an auxiliary screw. In Port Phillip she became the training-ship for the local naval brigade, but proved very costly; in 1881 she was cut down to a single-decker, and in 1898 was sold to private owners for use as a cold-storage depot-ship; in 1901 she was brought round to Port Jackson and cut in half, one part being converted into a coal-hulk in Neutral Bay (it is now at Launceston in Tasmania), and the other into a lighter, which according to report, is still in use. The *Cerberus*, which carried in her two turrets four 18-ton muzzle-loading rifled guns arrived in 1871, and in her day was the most powerful ship in the southern hemisphere. She reposed peacefully off Williamstown for more than a generation, and when defence became a more live subject was declared to be hopelessly obsolete and her guns of very little use.

In 1867 Robert Rutter, a civil engineer of Sydney, proposed to build a floating battery shaped like a life-buoy, with a displacement of 5620 tons; her armament was to consist of 24 100-pounder guns which she was to discharge while revolving on her axis, thus keeping up a continuous broadside.

In 1869 a definite proposal was made by the admiralty to establish a permanent Australian naval force, the colonies to pay half the cost and the upkeep. This proposal fell through. In 1872 the first two of five armed schooners were built in Sydney to the admiralty's order; their original names, *Nea* and *Eglantine*, taken from two Sydney ladies, were changed by a shocked admiralty official to *Alacrity* and *Beagle*. The other three, *Conflict*, *Renard*, and *Sandfly*, were launched shortly afterwards. These schooners were not intended for defence, but for the control of Queensland labour-recruiting in the Pacific; a decade later they were sold, the *Alacrity* and *Conflict* in 1882, the *Beagle*, *Renard*, and *Sandfly* in 1883. In 1876 Lord Carnarvon, then secretary for the colonies, selected Sir William Jervois (q.v.) and Colonel Scratchley (q.v.) to discuss with the colonial governments a policy of naval defence. The notion that any government except the British should be concerned with naval matters does not seem to have occurred to anyone in previous years. In 1878 Scratchley published his reports. His naval proposals were based on the policy of leaving offensive action at sea entirely to the Australian squadron of the royal navy; but he recommended that the wealthier colonies should provide a few swift ironclad gunboats to protect trade, and a few torpedo-boats or launches to act in conjunction with shore batteries erected on the principal harbours and estuaries. He further recommended that all locally provided vessels should be manned by locally established naval brigades, and that all floating defences should be strictly under the control of the officer commanding the Australian squadron. Political changes in the colonies killed this scheme, but in 1881, at an inter-colonial conference, the premier of South Australia revived the proposals of 1869. The four eastern colonies rejected them, on the ground that, as large imperial interests were involved, the maintenance of sea-defences was entirely within the province of the British government; land-defences, they admitted, should be a charge on the colonial governments. Each colony now proceeded independently. In New South Wales a naval brigade had already been formed, mainly to reinforce the squadron in times of emergency, and in 1881 the admiralty gave it the screw-corvette *Wolverene* as a training-ship. Besides the *Victoria*, *Nelson*, and *Cerberus*, the naval defences of Victoria in 1885 included the *Childers*, a first-class torpedo-boat, two second-class torpedo-boats, and four harbour trust dredgers armed with old guns; Queensland in 1884 commissioned two gunboats (the *Gayundah* and *Paluma*) and a torpedo-boat (the *Mosquito*); South Australia in the same year obtained the small, but heavily armed, cruiser *Protector*, specially designed for driving raiders out of the South Australian gulfs into the open ocean. The vessels had scarcely reached Australian waters when Britain and Russia found themselves on the verge of war through the capture by Russian troops of Penjdeh in Afghanistan. Luckily the British squadron in the western Pacific was at the same moment strengthened by the arrival of the armoured cruiser *Nelson*, and still more by the appointment to command of Admiral Sir George Tryon (q.v.), whose energy was at once shown by his requisitioning of two mail-steamers as auxiliary cruisers.

The independent efforts of the four colonies, narrated above, had not satisfied the imperial authorities, who held that Australia should take over a share of the responsibility for defence at sea, as distinguished from that of harbours and coasts. Tryon had therefore been instructed to confer with the colonial premiers, and during his stay laid down the principle that personal service was better than any amount of subsidy—a declaration which in after years became the watchword of the advocates of a really Australian squadron. More immediate results of Tryon's work became evident at the colonial conference of 1887 (see IMPERIAL CONFERENCES), where it was decided that the existing British squadron in Australian waters should be supplemented by an 'auxiliary squadron' of five fast third-class cruisers and two torpedo-gunboats. Beyond certain limits these vessels could be employed only by permission of the colonial governments, but within them they were to be controlled by the officer commanding the Australian squadron, which was to be maintained at its normal strength. They were to be constructed at British expense, and were to revert to Britain whenever the agreement terminated;

the colonies concerned were to pay 5 per cent on their prime cost and £91,000 a year towards their maintenance; three cruisers and a gunboat were to be in permanent commission and the remainder kept in reserve in Australian ports. Though this agreement did not realize Tryon's ideal, it was at any rate the beginning of a definite Australian enterprise, and a locally manned and locally controlled squadron was out of the question so long as Australia had no central government. The agreement—which was for ten years, subject to two years' notice of termination on either side—was ratified by most of the colonies during 1888 and by Queensland in 1891. When the ships arrived, they became a working portion of the Australian squadron.

Second Period.—In 1893, owing to financial stress, all-round reductions were made in defence expenditure. Victoria and Queensland put their warships out of commission and reduced their naval establishments; South Australia placed the *Protector* in reserve; New South Wales, favoured by the presence of the squadron, declined to replace the *Wolverene* (which had been broken up in 1889), and left her naval brigade to struggle along as best it could. For the next six years little advance was made; but in the winter of 1899 the naval commandants of New South Wales, Queensland, South Australia, and Tasmania, and the secretary of the Victorian defence department drew up a report of great importance. Avowedly basing their recommendations on the high value which Admiral Tryon had placed on personal service, they asked that the existing local forces should be made 'efficient and available for service in vessels of war.' They complained that little or nothing had been done towards the drilling and training of Australian seamen, as the vessels in reserve of the auxiliary squadron had always been laid up in Sydney and no attempt had been made to utilize them for training. They pointed out that 'the present policy, namely that of payment in specie in return for naval defence furnished *in toto* by the mother country, makes for no advance whatever.' Not only should the several naval brigades be amalgamated into a single federal force, but the admiralty should provide ships of a type which would be effective for service in time of war, and in which the local forces could be drilled in time of peace. They calculated that the actual expenditure on local naval forces, *plus* the contribution under the 1887 scheme, would maintain five second-class cruisers and a reserve sufficient both to man them in time of war and to make up wastage in the Imperial squadron.

During the 'Boxer' war in China three vessels of the auxiliary squadron were lent to the admiralty for service there; Victoria and New South Wales also sent their naval brigades for land service, and South Australia contributed the *Protector* (see CHINA NAVAL CONTINGENT). When the vessels so lent returned, the whole naval situation became a subject of debate. On the one hand objections were raised to the use of Australian vessels and men in fighting which did not directly concern Australia. On the other hand the limitations under which British admirals controlled the auxiliary squadron had for some time disturbed both the admirals and the admiralty. Commanders did not wish to co-operate with a squadron over which they had not full control, and the admiralty, at last finding it necessary to take the colonies seriously, began to develop its strategic creed in a series of propositions for their enlightenment—that naval defence cannot be a matter of merely local interest; that it consists, on the contrary, of a general offensive to destroy enemy ships wherever they may be; and that this conception necessitates a single navy under one control. These principles influenced the Australian delegates at the colonial conference of 1902. Captain W. R. Creswell, the naval commandant of Queensland, had just before that event revived the contentions put forward by the commandants in 1899, and suggested that the Commonwealth should provide a squadron of five cruisers—one to be built every second year—for use as training-ships for the local forces, a training-ship for boys, and a navigation school for naval reservists. The cruisers would be manned in peace time by reduced crews and raised to war strength from the naval reserve; they would form a reserve for the Imperial squadron in Australian waters, capable of operating wherever required. This report was freely quoted and discussed at the conference. The admiralty's contribution was a memorandum in which the principles already stated were set forth, and the first lord personally stressed the need of a single controlling naval authority. In order to make some concession to the Tryon principle of personal service, he suggested that one, if not two, cruisers of the Australian squadron should be manned exclusively by Australians under the command of Imperial officers, and that these ships should be interchanged occasionally with ships of other squadrons. He also suggested the formation of branches of the royal naval reserve, and insisted on the futility of confining the activity of the auxiliary squadron within narrow geographical limits—they should be available for service anywhere in the eastern seas.

The outcome of the conference was a scheme giving effect to these views. The old distinction between ships of the royal navy provided by the Imperial government and the ships paid for by Australia was abolished. The admiralty bound itself to maintain a squadron of definite strength based on Australian ports but operating wherever required by the naval exigencies of the occasion, The Commonwealth agreed to pay five-twelfths of the total cost annually up to a maximum of £200,000, New Zealand paying one-twelfth. Three drill ships, and one other, were to be manned as far as possible by Australians and New Zealanders, and officered by R.N. and R.N.R. officers. Eight navy cadetships were given annually to Australia and two to New Zealand, and branches of the royal naval reserve were to be established. In London the novelty of this scheme was not realized, and it was looked upon as merely an extension of the 1887 arrangement. But in point of fact, though probably without knowing it, Lord Selbourne had abolished the idea of hirer and letter, which gave Australia a definite feeling of practical ownership, and had substituted that of subsidy, against which Australians had protested in 1887 and at all times since, when the question arose. In some sense the auxiliary squadron had been to the bulk of Australians a personal possession, about the use of which they had often been jealous and selfish; the new squadron was not theirs at all. In spite of a distinct gain in the matter of personal service, public opinion resented what it considered a distinct loss. In the Commonwealth parliament George Reid, and later Alfred Deakin, made public their objections to the subsidy, and popular feeling ran so high that at the elections of 1903 ministerial candidates were seriously hampered (and in

some cases defeated) because of their adherence to the new agreement.

One good thing came of all this agitation: the naval brigades, so long neglected, gained some prominence. Before federation they were probably valueless as active forces; but they proved invaluable to Australia in other ways; they maintained, through long periods of neglect and discouragement, the belief in personal service, and they provided, when public dissatisfaction with the 1902 scheme became resistless, the germ of a constructive counter-proposal.

The naval forces in the several States, and all persons whose employment was connected therewith, were transferred to the Commonwealth on 1 March 1901, but until 28 February 1904 were administered under the State acts and regulations. On 1 March 1904 the Commonwealth Defence Act of 1903 came into force, and an amending act of the same year established a naval board of administration with a director of naval forces as its executive officer. On 12 January 1905 the new board came into existence, and Captain William Rooke Creswell, who had commanded the naval forces since 27 February 1904, was appointed director. The ships taken over from the States were in poor condition and had not even nucleus crews—the natural result of ten years' unsystematized economies. They were:—

from Victoria:
Cerberus, twin-screw armour-plated turret-ship, 4 guns, 3480 tons, 1660 h.p.
Countess of Hopetoun, first-class torpedo-boat
Childers, first-class torpedo-boat
Lonsdale, *Nepean* } second-class torpedo-boats

from Queensland:
Gayundah, *Paluma* } twin-screw gunboats, each 2 guns, 360 tons, 400 h.p.
Mosquito, second-class torpedo-boat
Midge, torpedo-launch

from South Australia:
Protector, cruiser, 6 guns, 920 tons, 1641 h.p. and a second-class torpedo-boat

In 1905 Creswell put forward a scheme for a local squadron of three 3000-ton 'cruiser-destroyers,' 16 destroyers, five first-class and eight second-class torpedo-boats, to be constructed (in Australia as far as possible) within five years; the scheme also included provision for the eventual manufacture of munitions and ordnance in Australia, and the assumption by the Australian forces of responsibility for local defence, the squadron becoming an integral part of the Imperial navy. These proposals stirred the Commonwealth government to ask the British committee of Imperial defence to prepare a general scheme of Australian defence, and early in 1906 Creswell was sent to England to study naval developments, especially as they affected destroyer and torpedo-boat work. During his absence the report of the committee of Imperial defence reached Australia, and was found to include a condemnation in general terms of his scheme, mainly on the ground that a destroyer force was not at the moment needed, and would be supplied by the admiralty when it was. His fellow-commandants took the opportunity of his return to Melbourne to contest this condemnation, and put forward a modified scheme comprising four ocean-going destroyers, 16 coastal destroyers, and four first-class torpedo-boats. Under admiralty influence Deakin rejected this proposal; but in 1907 his persistent advocacy of some form of local squadron or flotilla forced the admiralty to make some concessions, and he brought back from the Imperial conference of that year a new scheme for a flotilla of nine first-class torpedo-boats and six submarines. Local expert opinion at once condemned this proposal, largely because the submarines of those days, while capable of useful work in the comparatively shallow seas off western Europe, were quite unsuited to operations in the deep channels, rapid currents, and storm-ridden areas of Bass Strait and the Tasman Sea. This scheme, therefore, also fell through; but Deakin put aside from surplus revenue an amount sufficient to build several torpedo-boats whenever parliament should give him permission. Fisher, succeeding him in April 1910, adopted a scheme for 19 destroyers (practically that of the commandants in 1906) and used Deakin's savings to build three of them at once.

Third Period.—Early in 1909 the whole Empire was alarmed by the speeding up of warship construction in Germany and by speeches made on the subject by the British foreign secretary, Sir Edward Grey, and the first lord of the admiralty, Reginald McKenna. Enthusiasts in Sydney initiated a movement for presenting to the mother country a battleship of the then new 'Dreadnought' type; the premier of New Zealand, Sir Joseph Ward, with still greater enthusiasm offered two. About £100,000—manifestly a quite inadequate sum—was raised by private contributions in Sydney, and after some manoeuvring the premiers of New South Wales and Victoria were induced to offer a 'Dreadnought' jointly, if the Commonwealth refused to do so. Andrew Fisher, then prime minister, preferred to spend money on a local squadron, but suggested an Imperial conference on naval affairs, and offered to place all Australian warships at the disposal of the admiralty automatically whenever war might seem imminent. At the critical moment Fisher was ousted from office by a coalition between the followers of Deakin and of Joseph Cook, and the new ministry sent to the naval conference a delegate (Colonel Foxton, q.v.) who was instructed to offer a 'Dreadnought' or any other form of help that the coming conference might recommend. The conference met on 28 July, discussed naval matters on 3, 5, and 6 August, and in the end recommended (as far as Australia was concerned) that the whole system of Pacific defence should be remodelled. A Pacific fleet was to be constituted of three units, one specially attached to the Australian station, one to the East Indies, and one to the China station; the last-mentioned would take charge of New Zealand. Each unit was to consist of a large battle-cruiser (*Indomitable* type), three second-class cruisers (*Bristol* type), six destroyers ('River' class), and three submarines ('C' class). The battle-cruiser offered by New Zealand would be the flagship of the China unit, and that offered by Australia of the Australian unit; the units would meet periodically to carry out fleet exercises. The East Indies and China units would remain under direct admiralty control, but the Australian unit would be paid for, controlled, and eventually manned entirely by Australians, great care being taken to ensure the maintenance in Australian ships of British naval standards. This acknowledgment of the long-favoured Tryon principle of personal service as against subsidies was heartily welcomed in Australia; the 'unit' scheme was developed and improved in details by the Imperial conference of 1911, and, until the war of 1914-18 'scrapped' all previous naval arrangements, remained the Australian ideal of naval defence in the Pacific.

The Commonwealth's efforts were now directed

single-heartedly towards the completion of its unit and the necessary accessories. In September 1910 two destroyers, the *Parramatta* and *Yarra* (ordered by Fisher in 1908), reached Australia; a third, the *Warrego*, was shipped out in parts, put together at Cockatoo Island dockyard, and commissioned on 1 June 1912. The battle-cruiser *Australia* and the light cruisers *Melbourne* and *Sydney* arrived in 1913, and the two submarines in 1914. A naval college for training officers was established temporarily at Geelong in Victoria, and moved to its permanent quarters at Jervis Bay in New South Wales in 1915. The Commonwealth government in 1911 purchased from New South Wales the reformatory ship *Sobraon*; she was remodelled and placed in commission as the *Tingira* for the training of boys for the personnel of the Australian navy. The age of entry is from 14½ to 16½ years and the boys must engage to serve until they reach the age of 30. Training lasts one year, and trainees are then drafted to a sea-going warship of the fleet. (At the time of launching, 1866, the *Sobraon* was the largest vessel afloat, length 320 feet, beam 38 feet.) In 1910 the Fisher ministry invited Admiral Sir R. G. Henderson to report on the location of naval bases and training schools, and requested that he would make any other suggestions he chose; his report therefore, while dealing adequately with the subjects at first suggested, expanded into an elaborate memorandum covering the whole development of a purely Australian navy for the next 20 years. Entirely neglecting the conception of units—and basing his estimates on the proportion borne by the trade and population of Australia to that of Great Britain, he planned a fleet of 52 ships, with a personnel of 14,844, and an organization into squadrons and flotillas, for which 16 bases and sub-bases would be required. This fleet was to be acquired during four 'eras,' the first being of seven years (1911-18), the other three of five years each. At the end of the first era the fleet would consist of 23 ships with 4384 men. The report was handed in early in March 1911, but was not favourably received. The minister of defence (Senator G. F. Pearce) accepted its immediate recommendations—'it is quite possible,' he said, 'to proceed a certain distance along the route marked out without committing ourselves to the whole scheme;' but the prime minister (Andrew Fisher) declared that it could 'not in any way serve as Australia's share in the defence of the Empire. Sir Reginald Henderson has only concerned himself with the local Australian aspect of defence, and not gone into matters affecting the Empire generally.' Work was begun on some of the proposed bases, and the naval administration was reorganized as Henderson suggested; the ambitious 'Australian navy' proposals were soon forgotten; certain recommendations regarding the size of additional ships were accepted in principle, but the scheme was in abeyance at the outbreak of war in August 1914.

Meanwhile the unit scheme had been transformed almost out of existence. Persistent attempts were made from 1912 onwards to persuade Australia and New Zealand to leave their battle-cruisers in European waters, and New Zealand agreed. Ships of a less important type were sent to the China and East Indies units as flagships, and the *Australia* (see AUSTRALIA, H.M.A.S.) was thus left the only ship of her type in Eastern Waters. This naturally made the 'Pacific fleet' an absurdity, and in March 1914 Winston Churchill, then first lord, announced that battle-cruisers were not needed in the Pacific and should be employed nearer home. Senator E. D. Millen, then minister for defence in the Commonwealth ministry (Joseph Cook's), challenged him at once, declared that the admiralty had broken the agreement of 1909-11 without giving Australia any notice, and demanded another naval conference. While negotiations in this connection were still in progress, war came.

The Australian navy as it fought in the war, consisted of the following vessels:—

	tons.	knots.	guns, etc.
Battle-cruiser:			
Australia	19,200	26	8 12-in.
Light cruisers:			
Melbourne, *Sydney*, *Brisbane*	5400	26	8 6-in.
Encounter	5900	21	11 6-in.
Small cruisers:			
Pioneer	2200	17½	8 4-in.
Psyche	2100	17½	6 4-in.
Destroyers:			
Parramatta, *Yarra*, *Warrego*, *Huon*, *Swan*, *Torrens*	700	27	1 4-in. 3 18-in torpedo-tubes
Submarines:			
AE 1 and *AE 2*	800	16	4 torpedo-tubes
Gunboats:			
Protector	920	14	3 4-in.
Gayundah	360	10½	1 4.7-in.
Sloops:			
Fantome	1000		2 4-in.
Una	980		4 4-in.

The Australian submarine depot-ship *Platypus* and the oil-tanker *Kurumba* were used by the admiralty in European waters during the war. All the other ships were manned by Australians, but in the larger ships there was a considerable number of officers and men who had been borrowed from the royal navy before the war broke out. The *Encounter* had been lent for service while the *Brisbane* was building, and the *Pioneer* was a gift from the Imperial government; at the request of the admiralty the *Psyche* and the *Fantome* were manned by the R.A.N. in 1915. The *Una* was captured by the R.A.N. at Rabaul in 1914. At the close of the war the Australian navy was employing the following personnel:—

Royal Australian navy (sea-going) 325 officers, 4647 men (including those lent by the R.N.).
Royal Australian naval brigade 151 officers (69 mobilized), 4341 men (2099 mobilized).

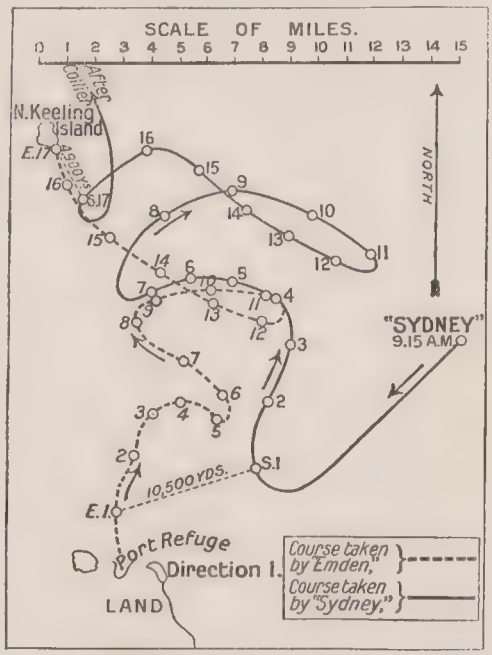
Although it had been placed under the imperial command at the outbreak of war, a technical misunderstanding postponed the transfer of the fleet to British control till 10 August 1914. Before the actual outbreak steps had been taken for the defence of Australia and for the prosecution of war in the Pacific. In the early days of August the *Australia* and *Sydney* with the destroyer flotilla were on their way to the Bismarck Archipelago, hoping to find the *Emden* and *Konigsberg* of the German Pacific squadron. Entering Blanche Bay on the night of 11 August, they found that the cruisers had left. Admiral Patey (q.v.), surmising that they were proceeding to the Atlantic, asked to be allowed to give chase, but was ordered back to escort the military expeditions which were being sent from New Zealand and Australia to occupy Samoa, the Bismarcks, and New Guinea. About the middle of September the *Emden* appeared off Bengal, and German cruisers off Samoa. The *Australia* was sent to Fiji, and the *Melbourne* and *Sydney* to Port Jackson to escort

troops to Egypt. After Coronel the *Australia* was despatched to the western coast of Mexico, to join other ships and prevent the Germans from making a break back to Canadian waters; on the way she captured the German supply-ship *Elenore Wormann*. She was then called to England, to be flagship of the second battle-cruiser squadron in the North Sea. Owing to damage sustained in a collision she missed Jutland (see AUSTRALIA, H.M.A.S.).

Towards the end of October the *Melbourne* and *Sydney*, together with a British and a Japanese warship, were convoying 30,000 troops to Egypt. On the morning of 9 November signals were received from Cocos Island that a strange warship was approaching. The *Melbourne* immediately set off, but her captain, remembering that he was responsible for the convoy, signalled the *Sydney* to proceed. The enemy proved to be the *Emden*. She had in the meantime landed a party of about 40 men to wreck the wireless and cable station on Direction Island. As the *Sydney* approached, the *Emden* steamed out to do battle at closer quarters. The *Sydney* had the heavier guns, the longer range, and the greater speed. But whereas the admiralty information was that the *Emden* could do no great damage at five miles, it turned out that, through the German system of elevating the guns, she could fire effectively at six or over. The *Sydney* therefore met with a surprise, and received some initial injury. Captain Glossop, seeking to use his guns at their most effective rather than their farthest range, had brought his ship within reach of the enemy, and in 15 minutes the *Sydney* received hits from 15 shells, though only five of them burst. Her range-finder was wrecked and its operator killed, as were also some men among the gun-crews. On discovering his mistake as to the *Emden's* range, Glossop steamed out farther, and while the enemy sought to come in closer, he manoeuvred so as to get her at his mercy, while he himself sustained no further damage. The courses taken by the two ships are shown in the accompanying diagram. The *Sydney's* shells worked such havoc that the *Emden* retained neither the speed nor the firing-power necessary for her purposes, and Glossop brought his vessel within three miles (see position 7) and there fired a torpedo, though without result. Eventually von Müller decided to run the *Emden* ashore on Keeling Island. Assured that she was securely aground, Glossop then went after her attendant collier, the *Buresk*, which he overtook as the Germans were sinking her. After taking off her crew, he completed the sinking with his guns, and then returned to the *Emden*. The German flag was still flying, and, as he could get no answer to his call for surrender, he proceeded to demolish her from a distance of two miles. After two salvos the flag was lowered and a white sheet displayed. Uncertain of the situation on Direction Island, Glossop lay on and off all night, visited the cable-station in the morning, and, finding that the German landing-party had escaped the evening before in a small schooner (the *Ayesha*) which they had seized, he returned to Keeling Island, where he found the *Emden* riddled with shots, littered with dead, and with 70 men wounded and practically untended. These, and 110 other prisoners, he took off to the *Sydney*, and then made for Colombo.

[Meanwhile von Mücke, the commander of the German landing-party, had made for the Dutch East Indies in the *Ayesha*. From Sumatra he and his men were picked up by a German coasting steamer and carried across the Indian Ocean. Slipping into the Red Sea, they landed on the Arabian coast, reached the Mecca railway, and thence made their way back to Germany via Constantinople. Their romantic adventure does great credit to their spirit and resource.]

From Colombo the *Sydney* proceeded to Egypt, and thence with the *Melbourne* to the West Indies, where for 18 months both cruisers formed part of the patrol between Halifax and Panama and down the east coast of South America. Of the remaining ships, the *Pioneer*, a relic of pre-Commonwealth days, was sent to East Africa, and was present at the blockade and destruction of the *Konigsberg*. In the midst of this activity the two submarines AE1 and AE2 were lost, the former somewhere near Blanche Bay, the latter in the Dardanelles, whither she had been sent at the end of December 1914. On 25 April 1915 she was ordered to try to force the straits, and was the first British ship so to do, but received such damage that her crew were compelled to sink her and surrender. By this time plots were being formed by the Germans in San Francisco to stir up revolt in India, and Australia was asked to send all available help. The three destroyers, *Parramatta*, *Yarra*, and *Warrego*, the old cruiser *Encounter*, the *Psyche*, the *Una*, and the *Fantome*, were despatched to the China station. The *Encounter* was soon sent back to Australia and the *Una* to the Bismarcks, and after a year the three destroyers were relieved by three others, the *Huon*, *Swan*, and *Torrens* (which had been built in Australia). The newly



The pairs of numbers represent the positions of the two ships relatively to each other at various stages. Thus 1, 2, etc. on the course of the *Emden* correspond to 1, 2, etc. on the course of the *Sydney*. The dotted line E.1----S.1 indicates the beginning of the action at a range too favourable to the *Emden*. The stage at which the *Sydney* attempted unsuccessfully to torpedo the *Emden* is indicated by the figure 7 on the respective courses, the range at the time being 5500 yards.

commissioned *Brisbane* left for Malta. In 1917 the six destroyers were ordered to the Mediterranean to take part in the anti-submarine campaign, while the *Encounter*, the *Protector*, the 'quite obsolete' *Gayundah*, and the 'prehistoric gunboat' *Countess of Hopetoun* were left to guard the Australian coasts.

During 1917 the German raider *Wolf* laid mine-fields off the Cape of Good Hope, Bombay, Cape Howe, Cook Strait, and North Cape in New Zealand, and several ships were sunk. The *Wolf's* exploits brought the *Brisbane* back from Malta to Australia. After searching the Indian Ocean with the aid of a sea-plane, she was sent to patrol New Guinea waters. A second raider, the *Seeadler*, a converted merchantman, visited the Pacific in 1917, but did little damage before stranding on an island in the Society group. Her commander and some of the crew made an unlucky dash to Fiji; the rest made for South America, where they were interned. These raiders caused a hastily improvised but continually improved system of local patrols to be organized by Australia and maintained up to the end of hostilities. In the meantime the bigger ships, after leaving the Atlantic patrol in 1916, were employed in the North Sea to shepherd convoys of merchantmen across to Norway. The *Sydney* in the course of her work scouted for submarines and had an encounter with a zeppelin. The destroyer flotilla worked with British flotillas at the mouth of the Adriatic, often aiding Italian transports in difficulties. At the close of the war the Australian ships were thus distributed:—In British waters: *Australia, Melbourne, Sydney, Platypus,* and *Kurumba*; in the Mediterranean: *Brisbane* and six destroyers; patrolling Australian trade-routes: *Encounter* and *Fantome*; patrolling Bismarck Archipelago: *Una*; in minor patrols off Torres Straits, Fremantle, Spencer Gulf, Bass Strait, and north-western Australia: *Protector, Countess of Hopetoun,* three small steamers, and two ketches.

Practically all the shore work during the war, as well as all manner of local patrols and most of the mine-sweeping, was entrusted to the royal Australian naval brigade (which in pre-war times was the reserve). It was responsible from 3 August 1914 to 21 November 1918, for the examination service at the ports of the six State capitals; for the port war-signal stations at the same ports and at Albany up to 2 December 1918; for harbour patrols at the nine defended ports; for dock defences (guards, booms, and net defences); for mine-sweeping off the ports; and for an immense amount of naval intelligence work. In 1916 it took over the guarding of wireless-stations, and in 1917 the guarding of wharves and ships and the examination of all cargo and baggage to prevent internal explosives from being smuggled in. It also supplied crews for coastal patrol vessels, officers and ratings for R.A.N., guns' crews and signallers for defensively armed merchant vessels, telegraphists for wireless service, and about 300 volunteers for the A.I.F. Two detachments—the naval contingent and the royal Australian naval bridging train—went overseas, the former aiding in the seizure of the German Pacific islands, and the latter serving with the ninth British corps at Suvla and afterwards in Egypt. The contingent was called for on 9 August 1914, mobilized by the 15th, and sailed for Rabaul on the 17th. After a few weeks' training on an island off the coast of Queensland, the 500 men joined a military expedition and sailed for Blanche Bay, where they captured the German wireless-station, while the battalion was sent on to capture Rabaul. The bridging train was raised in February 1915 for service in Flanders, but in July was sent to the Dardanelles, where it reorganized the water-supply, created an excellent harbour, and salved many wrecks. After the evacuation it was detailed for service on the southern portion of the Suez Canal in engineering and traffic duties and the construction and control of pumping machinery and filter-beds. In 1916 it was detailed to make a landing at El Arish, build jetties, and establish communications. With the advance into Palestine the need of military control on the canal ceased, and the train was disbanded. Some members joined the invading contingent, but most returned to Australia for further service in the R.A.N.

The Washington disarmament treaties of 1922 made a great change in naval defence schemes, and all warship building and naval base construction were suspended. The fleet personnel was reduced from 4843 in 1921 to 3500 in 1923, and ships in commission from 25 to 13. On 12 April 1924 H.M.A.S. *Australia* was sunk in accordance with the provisions of the Washington treaty. After the Imperial conference, the defence equipment bill was brought before the house on 27 March 1924 and received assent on 27 August 1924. It proposed the construction of two 10,000-ton cruisers—the maximum size at present allowed for new construction under the Washington conference—two ocean-going submarines, and a seaplane carrier. The cruisers are expected to be ready by 1928, and the submarines, now being built in England, in 1927. The seaplane carrier is to be built at Cockatoo Island dockyard, Sydney, by the Commonwealth shipping board. In addition the Commonwealth government is subsidizing the New South Wales government in the construction of a large floating dock which will be available for naval use in times of war or emergency. From July 1908 to June 1924 the expenditure on Commonwealth naval construction amounted to £7,171,583.

SHIPS OF THE ROYAL AUSTRALIAN NAVY, JUNE 1925.

Vessel.	Description.	Displacement.	Power.
		tons.	h.p.
Adelaide	Cruiser	5,500	25,000
Anzac	Flotilla leader	1,660	36,000
Brisbane	Cruiser	5,400	25,000
Cerberus	Motor-boat	61	220
Penguin	Depot-ship	5,880	12,500
Geranium	Sloop	1,250	2,000
Huon	T.B. destroyer	700	11,300
Mallow	Sloop	1,200	1,800
Marguerite	,,	1,250	2,200
Melbourne	Cruiser	5,400	25,000
Moresby	Sloop	1,320	2,500
Parramatta	T.B. destroyer	700	9,000
Stalwart	,, ,,	1,075	27,000
Success	,, ,,	1,075	27,000
Swan	,, ,,	700	10,000
Swordsman	,, ,,	1,075	27,000
Sydney	Cruiser	5,400	25,000
Tasmania	T.B. destroyer	1,075	27,000
Tattoo	,, ,,	1,075	27,000
Tingira	Boys' training-ship	1,800	.....
Torrens	T.B. destroyer	700	10,000
Warrego	,, ,,	700	9,000
Yarra	,, ,,	700	9,000
Fleet Auxiliaries -			
Biloela	Fleet collier and oiler	5,700	2,300
Kurumba	Fleet oiler	3,970	.....

The *Moresby* (formerly the *Silvio*) is on loan from the royal navy for use as a surveying ship.

STRENGTH OF NAVAL FORCES (PERMANENT AND RESERVES), MAY 1925.

Description of Force.	Numbers Borne.		
	In Training.	Officers.	Men.
Royal Australian Navy (sea-going)	.....	406	4,219
Cadet midshipmen undergoing training at R.A.N. College	49	.....	.....
Boys undergoing training on H.M.A.S. *Tingira*	256	.....	.....
Royal Australian Naval Reserve (sea-going)	.....	58	.....
Royal Australian Fleet Reserve	.....	.....	131
Royal Australian Naval Reserve	.....	145	5,804
Royal Australian Naval Volunteer Reserve	.....	3	31

The following table shows the naval defence expenditure in various years from 1901-2 to 1924-5 in pounds sterling:—

Year.	Under Ordinary Votes and Appropriations.	Total. (*a*)
	£	£
1901–2	178,819	178,819
1906–7	255,120	256,066
1911–2	461,546	1,634,466
1916–7	1,510,542	6,641,249
1921–2 (*b*)	2,375,965	3,212,736
1922–3 (*b*)	2,124,491	2,575,131
1923–4 (*b*)	2,084,420	2,279,310
1924–5 (*b*)	2,086,021	2,386,234

(*a*) During the war years, and subsequently, war expenditure including that on works, is comprised in the total.
(*b*) Not including war gratuity.

After the war Admiral Jellicoe was invited to examine and report on the naval defence of the Commonwealth. Arriving in May 1919, he presented his scheme in August. It dealt largely with the far-Eastern problem, and his suggestions as to the size and character of the Australian fleet were made with a view to ensure effective co-operation with the royal navy in the event of any necessity arising. He proposed the following unit:—

1 New battle-cruiser
1 „ „ „ (*Australia* type)
4 Light cruisers in commission
4 „ „ „ reserve
1 Flotilla leader
10 T.B. destroyers in full commission
2 „ „ „ reserve
1 „ destroyer depot-ship
8 Submarines
1 Small submarine parent ship.

No effect was given to the report, and it is doubtful if there was ever any intention of doing so.

See *Official History of Australia in the War of 1914-18*, vol. ix; *The Royal Australian Navy*, by A. W. Jose, now (1926) in the press.

J.V.C.-B.

Needle-fish. See Long Toms.

Needle-wood or **Needle-bush,** popular names of *Hakea leucoptera*, a dry-country shrub or small tree from which tobacco pipes are made, the root-stock being carved in the same way as the brier-root (*Erica arborea*) of southern Europe. It is also known as the 'water-tree,' because the roots, when tapped, yield a limited supply of water to aborigines in desert country. Sir T. Mitchell describes (*Three Expeditions*, vol. i, p.197 of the first edition) how some aborigines

Needle-wood.

dug up the roots, cut them into billets, and sucked the abundant watery sap from them. See Hakea.

Nelson, Sir Hugh Muir (1835-1906), born at Kilmarnock in Scotland on 31 December 1835 and educated at the high school and the university of Edinburgh, migrated in 1853 to Queensland with his father William Lambie Nelson, who became a member of the first parliament (1860) but was unseated because he was a minister of religion. For 30 years Hugh devoted himself to squatting, but in November 1883 entered the legislative assembly as member for the Northern Downs. From June 1888 to August 1890 he was secretary for railways in the McIlwraith and Morehead ministries; he led the opposition while Griffith was in office (August 1890-March 1893) and then became treasurer and vice-president of the executive council under McIlwraith. It was a time of financial panic, and Nelson was responsible for measures which helped the colony over the crisis—e.g. the Queensland national bank agreement act and the public depositors relief act. When McIlwraith left for England in October 1893 Nelson took over the premiership in addition to his work at the treasury, and in March 1895 became also chief secretary. During this period there was grave industrial unrest in the colony; a shearers' strike in 1894 (see Strikes) almost became an insurrection, and necessitated the passing of a drastic act for the better preservation of peace. Nelson was opposed to the separation movement which agitated northern and central Queensland during the 1890s, largely because he feared dismemberment would lead to another financial crisis. In 1897 he represented the colony at the Jubilee celebrations and the colonial conference. When his ministry went out of office in April 1898, he became president of the legislative council, and on several occa-

sions acted as lieutenant-governor. He died on 1 January 1906. (K.C.M.G., 1896; P.C., 1897.)

Nemathelminthes, a group of so-called 'worms,' extended by some authorities to include not only Nematoda (round-worms) and Gordiacea (hair-worms) but also the two very aberrant and widely distributed groups Chaetognatha and Acanthocephala. It is probably better to regard these two groups as constituting distinct phyla; for convenience sake, however, both will be dealt with here.

The Chaetognatha comprise certain small transparent (or semi-transparent), free-swimming, marine, bisexual worms, provided with fins on the tail and the sides of the body, and armed anteriorly with numerous long, powerful, sickle-like jaws with which the prey is seized. Their geographical distribution depends largely on ocean temperatures, species which occur at or near the surface in polar regions being found only at considerable depths in warmer latitudes. The group has not been systematically studied in Australia. Detailed work has been carried out only in Shark Bay (Western Australia) and off the New South Wales and Queensland coasts. There are now known to occur in our waters 11 species of *Sagitta,* and one belonging to each of the genera *Pterosagitta, Krohnitta,* and *Spadella* —a total of 14, of which only one (*Spadella moretonensis*) appears to be purely Australian. The last-named lives among seaweed along the east coast of the continent; all the other 13 species are pelagic.

The Acanthocephala or hook-headed worms—all parasitic—are to be found in the adult condition infesting various Australian vertebrates, especially fishes, the black snake, certain birds and (occasionally) bandicoots. Introduced rats often harbour *Moniliformis moniliformis,* and pigs *Macracanthorhynchus hirundinaceus.* The larval stage of Acanthocephala is commonly met with, in an encysted condition, on the peritoneal lining and mesentery of various snakes, and in the subcutaneous tissues of ground-feeding birds. The group has not been thoroughly studied as a part of the Australian fauna; though a few species have been described, they have all been placed in genera that occur elsewhere. Some of the known species are *Echinorhynchus pomatostomi,* a larval form from several kinds of birds; *E. rotundocapitatus* from the black snake; *E. hylae* from the golden frog; *Gigantorhynchus semoni* from bandicoots; and *Centrorhynchus asturinus* from various hawks. Other genera (e.g. *Arhythmorhynchus, Bolbosoma, Echinogaster*) are known to be represented in Australian fauna, but the species have not yet been described or identified.

The Nematoda (usually so called) are divisible into two well-defined groups, true Nematoda and Gordiacea. The latter are the 'horsehair worms,' a name due to their rather stiff, brown, hair-like appearance at the adult, sexually-mature stage; they occur in fresh water, and may at times enter drinking-water. The immature stages are passed through in a coiled condition within the body of certain insects, from which the parasites escape by rupturing the body-wall. This difficult group has not been systematically studied in Australia, only one or two species in their free-living stage having been described.

Nematoda (strictly so called) include both free-living and parasitic forms. The former occur in salt, brackish, and fresh water as well as in damp earth and in all kinds of decomposing vegetation. Of the parasitic forms some are parasitic in plants e.g. the 'eel-worms' of potatoes (*Tylenchus radicicola*), those causing 'ear cockle' of wheat (*T. tritici*), the root-galls of many cultivated and other plants, etc., some of these tiny parasites being extremely resistant to adverse conditions, and able to withstand many years of desiccation. A great many infest animals, from insects and other arthropods to man. Some pass through their larval stages as parasites of an intermediate host, which forms the prey of the final host; or one phase of the life-cycle may be spent in various tissues of the body of an animal, the adult stage infesting only the alimentary tract. Others have a direct development. Some are parasitic during their immature periods only; in other cases it is the young stage which is free-living. Certain Australian species exhibit an alternation of generations—a parasitic, parthenogenetic form (i.e. one which produces eggs and embryos without the intervention of a male) gives rise to free-living sexual individuals, male and female, and the latter, on fertilization, produce young which may develop into free-living forms or into the parasitic stage. The lung-worm (*Rhabdonema* or *Angiostoma*) of frogs is one of these. Another is *Strongyloides stercoralis,* a tiny parasite not uncommon in the human intestine in the coastal districts of Queensland; in its free-living stages it is capable of withstanding desiccation for prolonged periods.

The nematode parasites of the Australian fauna have not been intensively studied, though a number of species from various hosts have been described. In some cases (e.g. the parasites of certain families of birds) the worms belong to species known elsewhere. As might be expected, this is also true of those species found in human beings and in domesticated and introduced animals. The dingo, so far as is known, only harbours species which occur also in the dog.

Certain round-worms that infest man deserve notice on account of their prevalence and their influence on public health. Three are of paramount importance in Queensland—the filarial worm (*Filaria bancrofti*) and the hookworms, *Ankylostoma duodenale* and *Necator americanus,* the latter being more common than the former. The latter two blood-feeding parasites of the intestine are a menace to the development of the race (especially in the moister tropical and sub-tropical regions) through their effects on the health of those affected, particularly when children. So serious is the position in parts of Queensland that a widespread hookworm campaign has been in progress for some years to eradicate the pest. The most efficient treatment has been the administration of either carbon tetrachloride or oil of chenopodium (ascaridol). The eggs, after leaving the victim's body with the faeces, hatch out, and the resulting larvae, after moulting, can re-enter the body either through the mouth or, more commonly, by penetrating the moist skin (especially of the legs and feet), ultimately reaching the lungs, trachea, oesophagus, and finally the intestine, where they attain maturity. Related species occur in the cat, dog, and dingo in eastern Australia.

Filaria bancrofti commonly lodges in the lymphatics, and by obstructing the lymph circulation may cause various organs (e.g. the limbs, breasts, or male genitalia) to become more or less swollen; there may be chyluria and even a marked elephantiasis. The larvae when liberated from the parent reach the blood-stream, whence they may be taken up by certain night-biting mosquitoes;

in these further development occurs, and the larvae eventually enter the proboscis of the insect preparatory to re-entry into the human host when the mosquito bites. The life-cycle of the parasite in the insect requires from 6 to 15 days, according to the temperature. (See TROPICAL MEDICINE.) *Filariae* are not uncommon in birds, especially in Queensland, and are known to infest reptiles and certain marsupials (opossums, wallabies, and kangaroos), the best-known being *Filaria websteri* from the knee-joint of macropods. One species of *Ichthyonema* infests the gonads of certain marine food-fish. Dogs in northern Queensland commonly harbour a filaria (*F. immitis*) in the heart, and its presence often leads to fatal results.

The Ascaridae, though common in some Australian snakes, do not call for special mention, nor do the Heterakidae, some of which have been described from certain Australian birds. The Strongylidae are well represented, especially in wallabies and kangaroos, the parasites belonging to a special sub-family, Cloacininae.

The Oxyuridae occur very commonly in Australian frogs, reptiles, and insects, but have received little attention. The Spiruridae (using the term roughly) are known to infest various hosts, but the group has been very much neglected. A very remarkable worm, *Pneumonema tiliquae*, infests the lungs of 'blue-tongue' lizards (*Tiliqua scincoides* and *T. nigrolutea*); only females of this rather common parasite have been collected; perhaps it is a parthenogenetic form; it is armed with powerful recurved hooks on certain parts of the body.

A few of the nematode parasites of stock need special mention, since considerable work has been done in Australia in elucidating their life-history. These are species of *Habronema*, worms which infest the stomachs of horses, and *Onchocerca*, parasites which occur in the connective tissues of cattle. Of the former there are three species, two of which have been proved able to pass their larval stages in the house-fly and in many related Australian muscoid flies; the third completes its larval period in the stable-fly (*Stomoxys*)—see FLIES. The larvae of one or more of these may gain access to sores or bites on the skin of horses and give rise to certain summer sores (cutaneous habronemiasis). *Onchocerca* is now notorious for involving graziers and others in very heavy losses, since they are compelled to cut out certain parts of any beef-carcase intended for export. This loss amounts to tens of thousands of pounds annually. Three species are known to infest Australian cattle, one, *O. gibsoni*, being the cause of the formation of 'worm-nodules,' especially in the brisket and certain joints. The presence of this long parasite, which lies in a very close, tangled coil, causes an irritation of the surrounding connective tissues, and leads to the formation of a strongly fibrosed area or 'worm-nest' surrounding it. A great deal of research has been carried out in New South Wales, Queensland, and the Northern Territory in the attempt to elucidate the life-history of this species, which is extremely common in the cattle-raising regions of Australia. As yet no indication has been given as to what kind of organism is likely to be a transmitter; experiments with various ticks, flies, mosquitoes, lice, etc., have all given negative results, though a biting fly is likely to be the intermediary. The other two species of *Onchocerca*, though very common in cattle—at least in Queensland—are of little importance economically. One (*O. gutturosa*) especially infests the neck-ligament and certain joints; the other (*O. lienalis*) is found in the gastro-splenic ligament.

In regard to Australian free-living nematodes a considerable amount of work was done years ago by Dr. N. A. Cobb, but since then the group has been neglected. Perhaps distinctly related are certain small marine animals belonging to the Chaetosomatidae, of which four species (two belonging to *Chaetosoma* and two to *Notochaetosoma*) occur in the neighbourhood of Port Jackson.

See for Chaetognatha, Johnston and Taylor in *Proceedings* of the Royal Society of Queensland, 1919; for Acanthocephala, Johnston in *Proceedings* of the Royal Society of Queensland, 1912 and 1918, and *Proceedings* of the Royal Society of New South Wales, 1911; for Nematoda, Sweet in *Proceedings* of the Royal Society of Victoria, 1908-15, Johnston in *Proceedings* of the Royal Society of Queensland, 1911 and 1916. Johnston and Cleland have written on human parasites; Cleland, Johnston, Sweet, and others on onchocerciasis; Irwin-Smith on the Chaetosomatidae, and Cobb on free-living nematodes. These papers will be found in various volumes of the *Proceedings* of the Royal Society of Queensland, the *Proceedings* of the Linnean Society of New South Wales, the *Macleay Memorial Volume* of the same society, the *Agricultural Gazette of New South Wales*, and the *Report* for 1911 of the *Australasian Association for the Advancement of Science*, and the *Transactions* of the Royal Society of South Australia, 1921.

T.H.J.

Nemertinea, an isolated subdivision of worms which Hubrecht and Ray Lankester consider to be in the direct line of ancestry of vertebrate animals; its species are mostly marine. Of the extremely interesting land species one (*Geonemertes australiensis*) is found in Australia and Tasmania. This remarkable little worm has a yellowish cream-coloured stripe on the dorsal surface, the rest of the body being white; there are usually two dark eye-spots at the anterior tip, but the number is variable. When touched, the worm shoots out a long white proboscis, which may exceed the length of its body; this is everted somewhat after the manner of an inward-drawn glove-finger, and is armed with a terminal calcareous spine. *Geonemertes* is found associated with land planarians (q.v.), and in moist weather may be seen in shady localities crawling about on tree-trunks in the open. Though marine Nemertinea may be collected anywhere along the Australian coast, little or no attention seems to have been paid to them. Many are brilliantly coloured, and some are extremely long and delicate. T.S.

Nesbitt, F. See MCCRON, FRANCIS.

Nettle-tree. See LAPORTEA.

'New Australia.' In 1892 'The New Australia Co-operative Settlement Association' was founded by William Lane (q.v.), who had already in 1890 founded Australia's first Labour newspaper—the Queensland *Worker*—and during the shearers' strike of 1891 had been brought into close touch with the station-hands and shearers of western Queensland. Lane's object was to build up a social order based on brotherhood: his appeal to the men of the bush was characteristic:—

> Come together in all unselfishness to trust each other and to be free! To live simply, to work hardly; to win, not the gold that poisons, but the home that saves! . . . Come and work as free men for each other, to labour on the common land for the common good, and not for self alone, or for the selfish greed of another! One man by himself is powerless, but men in a body are strong!

The keynote of the appeal was the desire for a simple home life such as could not in those days be enjoyed by pastoral employees. But Lane's was not the only influence urging Australians at that time towards a socialist community; Bellamy's *Looking Backward* had a great vogue just then with 'arm-chair' socialists, and caused many town recruits to believe that in Lane's community they would find conditions of luxury and leisure approximating to Bellamy's imaginings.

The colonial governments were bitterly opposed to socialism, so that no grants of land could be expected from them; also it was thought that a journey overseas would, like the drinking-test of Gideon's army, keep out all but the really earnest; hence it was decided to migrate to some other country to establish the settlement. As is elsewhere told (see LANE, WILLIAM) recruits enrolled rapidly, and in their own ship the first New Australians left Sydney in July 1893 for Paraguay, where a government glad to get white settlers had generously granted a large area of good land under settlement conditions. But from the first there was no real unity among the colonists; and when, after some expulsions and many secessions, a second party arrived from Australia only to intensify the differences, it was clear that to build up a communal colony with the material in New Australia was utterly impossible. The dissensions which broke up the colony sprang from disagreements as to the essentials of co-operative life; for, though New Australia had enrolled many very suitable colonists, it had also proved a veritable Cave of Adullam to misfits, failures, and malcontents of the left wing of Australian democracy.

In May 1894, 58 people (39 being men, mostly bushmen) under Lane's leadership withdrew from New Australia to begin again the task of building up a communal settlement. The history of this second colony, called 'Cosme' (after the name of a river-ford near which the pioneers camped when waiting to obtain land), must be followed in order to trace the carrying out of the New Australia idea; for after Lane's party left the original colony troubles and dissensions increased there to such an extent that the Paraguayan government, acting on petitions received from various parties of the colonists, wound up the colony as a co-operative concern and gave each settler a block of land for his individual use.

The Cosme colonists bought for £400 on time-payment 16,000 acres of land situated 21 miles from a railway, about 50 miles south-east of Villa Rica, and occupying the fork of two small rivers. The land was half dense scrub and half low grass-land—the scrub soil deep and fertile, the open land good for pasture but useless for tillage. The Paraguayan government afterwards repaid the £400 and granted the land to the colonists on settlement terms. Cosme started with a capital of less than £400, mainly provided by English and Australian friends and the sale of members' personal effects. The women gave their jewellery, even their wedding rings—which last, however, were not sold but returned to the givers. The first months were filled with hard work and hard living. Rough shelters were rapidly erected—tents with grass-thatch flies, huts of saplings with grass roofs and sides. The task of clearing and planting went on with feverish haste, for the season was already late, and during the month before harvest the colonists lived mainly on beans bought on credit from a local storekeeper; but from then on there was a continual improvement in material conditions, though for a considerable time the housing was rough, and the food, though plentiful, was mainly vegetable and not sufficiently varied.

Under the influence of experience and changing circumstances, the Cosme ways of living became modified in detail, but no basic alterations took place throughout 12 years of communal existence. The experiences in New Australia led to the drawing up of a somewhat elaborate constitution, the object of which was to keep the management of the colony in the hands of tried and trusted officials. But as time went on it was found that no one would continue in office without the full confidence of members, so that in a few years the simpler plan of annual elections for all offices was adopted. The colony's affairs were then directed by a chairman, a committee, and an industrial manager; the committee (which met weekly) decided on the general plan of colony business; the industrial manager superintended all industrial matters and reported to the committee. The ordinary general meeting of members was held yearly, but special general meetings could be called at any time. All organized colony labour was co-operative, all males over 15 years of age, and single women over 16, being on the organized staff of workers. There was a 45-hour working week, and disagreeable work was shared round as much as possible. All wealth, except purely personal effects, was owned by the community. Land, houses, crops, machinery, tools, stock, and general goods were all communal property. Members had individual use-hold of house and allotment; such use-hold was permanent, and encouraged the individual to improve his house and to grow fruit or flowers in his garden. All adults had equal shares of colony earnings, irrespective of age, sex, capacity, or occupation. Proportionate shares were given to children according to age. Certain goods easily produced were placed on the free-list, and were served out without limit or charge. Limited supplies of home-grown products were shared equally. Goods bought from outside were supplied to members on an equal-credit system.

Cosme families lived in their own houses. Bachelors had houses of their own, but took their meals in the co-operative dining-room. The work of married women was not organized, and did not come under the direction of the management. Cosme children were reared in their parents' homes under parental control; family life was not interfered with. The income of the family depended solely on its size. Free schooling was provided.

The colony was a 'prohibition' settlement, though only a few of its members were teetotal before joining. There was no official church, members being free to belong to any denomination. Social life was active and varied. A social union managed sports, dances, concerts, plays, and general entertainments. There was a dance every Saturday night in the social hall, and a meeting—not a service—every Sunday night, when readings, recitations, vocal and instrumental music, and occasional lectures were given. The library contained 2000 volumes. A manuscript newspaper, *Cosme Evening Notes*, was published by being read aloud every evening except Sundays for the first four years, after which it became a weekly. The *Cosme Monthly*, a four-page octavo newspaper, was published regularly from the founding of the colony until

1903, when it changed its name to *Cosme* for a few issues and came out as a quarterly. It was printed in the colony and mailed away for propaganda purposes. Cards and draughts were favourite indoor games, and half the men played chess. Cricket, hunting, fishing, and swimming were the chief outdoor sports. The most noticeable effect of communal living was the constantly rising standard of art as evidenced in music, drama, and literature. The early concerts were crude, but singing classes developed musical taste and talent until opera and oratorio were produced and appreciated; the production of plays, too, improved from screaming farce through the comedies of Sheridan and Goldsmith up to Shakespeare. The growth in appreciation of good literature was just as marked, and *Evening Notes* provided a ready outlet and a kindly critical audience for any with a talent for scribbling.

In the early days primitive appliances were used for all kinds of work, but gradually machinery was obtained which made labour more productive; hoes were replaced by ploughs and cultivators, and a steam engine worked saw-bench, cane-mill, and corn-mill. The first Cosme cane-mill was made with wooden rollers and turned by bullocks. The colonists built two bridges to connect the settlement with the railway.

In 1896, the pioneering difficulties having been overcome, William Lane went to Britain for new members, especially for women, so as to give bachelors opportunity to marry. No difficulty was experienced in obtaining recruits, and the population of the colony increased to a total of 131 (November 1897). But the primitive housing and surroundings, hot climate, different and coarser food, insect-pests, rough and unaccustomed work, together with that general strangeness and newness of things so often the cause of homesickness, combined to make most of the new-comers dissatisfied, and soon induced them (especially the women) to forsake the colony. This failure to equalize the sexes very soon caused most of the pioneer bachelors to leave, as they had joined in the expectation of being able to settle down in homes of their own. Withdrawals owing to hardships steadily decreased as the years went by, and the standard of living rose.

William Lane left the colony in 1899, as he felt he could do more effective work by writing for the press; he also wanted to earn money to liquidate a loan which the colony had received and for which he regarded himself as personally liable. His brother John Lane, a pioneer member of the colony, was elected to the chairmanship. In 1901 another effort was made to increase membership. John Lane was sent as organizer to Australia, and no special difficulty was found in getting recruits, but the result was as before, though this time no one left on account of hardships. In May 1904 the population had decreased to 69, of whom only 33 were adults. A white colony in the midst of coloured people must of necessity either grow or lose its racial purity, and the fear of such a fate compelled many sincere co-operators to leave the settlement. In 1905 the colony began to disintegrate, gradually drifting into individualism, and the land and property were finally divided among those who remained. When the war broke out in 1914, practically all the young men of Cosme, and some of the older ones, volunteered for active service, paying their own expenses to England and enlisting there. Those who survived returned to Paraguay.

J.L.

Newcastle, the second city in New South Wales and the third port in Australia, is situated on the shores of Port Hunter—the estuary of the Hunter River—in lat. 32° 57′ S. and long. 151° 49′ E. The port was first entered on 19 September 1797 by John Shortland (q.v.), who had been chasing convict escapees northwards along the coast and was on his way back to Sydney. His discovery of coal (q.v.) near by resulted in a settlement on the banks of the Hunter (then usually called the Coal River); a little coal and a great deal of timber were exported, and in June-July 1801 Louis Barrallier surveyed the district—his map is reproduced in vol. v of the *Historical Records of New South Wales*—but in 1802 King was forced to abandon the settlement because it was too isolated from Sydney to receive proper supervision. In March 1804, however, he was instructed by the colonial office to re-establish it, and on the 15th he appointed Lieutenant Menzies of the marines (then aboard H.M.S. *Calcutta*) commandant of the district of Newcastle. To the village on Port Hunter Menzies gave the name 'King's Town' in honour of the governor; but the name, though it occasionally appeared in official documents till the early 1820s, soon disappeared from popular use, and Macquarie (possibly because he objected to the association of 'King' with anyone except the monarch) invariably used 'Newcastle' for both district and village. When Macquarie visited the settlement in 1812 it was already supplying Sydney with cedar timber, coal, and lime; in 1814 it was sending 154 tons of coal yearly to Calcutta, payment being made in Bengal rum; in 1818 Macquarie congratulated the retiring commandant, Captain James Wallis, on having 'advanced the Settlement at Newcastle, from the Appearance of an humble Hamlet to the Rank and Capabilities of a well laid out, regular and clean Town.' It was Wallis who commenced the breakwater between Nobby's Island and the mainland, which, though not completed until 1857, from the first greatly improved the entrance to the port. Entrance was also facilitated from the earliest days of the settlement by a coal-fire lit every evening on Beacon Head; at midnight on 31 December 1857 this primitive signal was replaced by the lamps of a lighthouse erected on Nobby's. The first church, a temporary structure, was put up in 1812 and services conducted in it by the settlement's assistant surgeon; in 1817 Wallis built Christ Church, 'a very handsome church with an elegant spire,' and in 1821 arrived the first ordained minister, George A. Middleton. Bigge in that year found the settlement orderly and well arranged. The town's seven streets contained 13 houses of government officials and 71 belonging to convicts, besides barracks to accommodate houseless prisoners. Timber-getting, which was the staple industry, was carried on by parties of convicts, sent sometimes as much as 70 miles inland, who returned on rafts formed of the logs they had cut. Coal-mining, which until 1817 had been carried on at a drift on a level with the shore under Beacon Head, was in 1820 done from a shaft 111 feet deep close to the commandant's house; it was unhealthy work, but the 27 men employed could raise 20 tons a day. The worst convicts were employed in lime-burning on the peninsula now called Stockton. Escape from

prison under these conditions would have been far easier than at Sydney, had not the commandants encouraged the neighbouring aborigines to track down fugitives and fetch them back to the settlement disabled and naked. Well-behaved convicts, on the other hand, were allowed to farm land in the vicinity of what is now Maitland; but Bigge succeeded in putting a stop to this humane practice.

In 1821 William Lawson, then commandant at Bathurst, discovered a practicable route from the western settlements down the Goulburn River to the Hunter and Newcastle. Shortly afterwards Governor Brisbane decided to abandon Newcastle as a penal settlement, although convicts were employed there for many years later in the mines.

In 1822 a stone gaol, erected on the site of the present hospital, was converted into a hospital. In 1828 a police-station was built, with George Muir as chief constable; during the same year a post-office was established, the mail-service between Newcastle and Sydney being maintained by the packet *Lord Liverpool*. On 12 June 1831 the *Sophia Jane*, the first steamer to arrive in Australia, visited Newcastle. On 1 August 1839 the Hunter River Steam Navigation Company was formed and imported from England three iron steamers, the *Rose*, the *Thistle*, and the *Shamrock*. In 1831 the Australian Agricultural Company (q.v.) took over the coal-mines; after 1845 competing companies opened up the Newcastle field; and the expansion of trade led to the establishment of a chamber of commerce in 1856. Meanwhile in 1847 Newcastle had become the seat of a bishopric, with Dr. Tyrrell as its first bishop. In 1859 it became a parliamentary constituency, and returned Arthur Hodgson to the assembly. In the same year it was incorporated as a municipality with James Hannell as mayor; it was not proclaimed a city until 1885. A newspaper, *The Telegraph*, had been published in 1855; in 1858 the *Newcastle Chronicle* appeared, in 1867 the *Pilot* (the first daily paper), and in 1880 the *Newcastle Dispatch*. In 1857 a railway was built from Newcastle to Maitland, and was gradually extended northwards to the Queensland border (see RAILWAYS); but not until 1889, when the Hawkesbury bridge (see VIADUCTS AND BRIDGES) was completed, were Newcastle and Sydney linked by rail. The city was first lighted with gas in 1856 by the Newcastle Gas Company; in 1891 electric light was installed. The water-supply, which was in earlier years under the control of the city and suburban municipalities, was in 1893 taken over by the Hunter district water-supply and sewerage board. Newcastle has now two sources of water-supply, one from the Hunter River (hard water), and one from the Chichester River (soft water). In 1914 the State government's dockyard at Walsh Island was officially opened, and in the following year the steel-works of the Broken Hill Proprietary Company (see IRON) were established. The city possesses a technical college and a museum; the new hospital now (1926) in course of erection on the old site will have accommodation for nearly 400 patients. The climate is mild and the average rainfall for the ten years 1914-25 was 36.74 inches. Newcastle has 10 suburbs—Hamilton (which is larger than the city itself, having 16,450 inhabitants against Newcastle's 15,150), Waratah and Wickham (both over 14,000), Merewether, Wallsend, Stockton, New Lambton, Adamstown, Lambton, and Carrington (these range from 7000 down to 3120). The population of city and suburbs combined is 95,070 (all the figures are for 31 December 1924, the latest procurable officially). The following trade statistics are taken from the report of the Newcastle Chamber of Commerce for 1924:

Vessels cleared outward for British, foreign, and interstate ports:—number, 1836; tonnage, 4,101,221.

Total value of imports from British, foreign, and interstate ports:—£1,584,918.

Quantity and value of coal exported to British, foreign, and interstate ports:—4,688,356 tons valued at £5,051,687.

Total value of exports, inclusive of coal, to British, foreign, and interstate ports:—£6,181,177.

Total amount of revenue collected in 1924:—£401,313 19s. 6d.

Value of exports, other than coal, in 1924:—£1,129,490.

N.J.D.

New Guinea. See PAPUA and MANDATED TERRITORY OF NEW GUINEA.

New Norcia. The New Norcia settlement ('Nursia' was the original spelling, after the Italian town where St. Benedict was born) lies on the Moore River about 80 miles NNE. of Perth. It was established early in 1846 by Fathers Salvado (q.v.), Serra (q.v.), and Tootell, with two brothers, as a centre for missions to the aborigines. A monastery was dedicated on 26 April, and, with the help of contributions from Europe, an aboriginal colony grew up round it where the natives were trained to farming, handicrafts, and even telegraphy. On 12 March 1867 Pope Pius IX made the monastery an abbey *nullius dioecesis*, with Dom Salvado as abbot and bishop. On 30 November 1899 he left Australia for Europe, and during a visit to Rome secured his successor, Dom Fulgentius Torres, and arranged the affiliation of the abbey to the Spanish Benedictine province (see BENEDICTINE ORDER). After Salvado's death at Rome on 29 December 1900 Dom Torres was appointed administrator apostolic, and on 2 October 1902 was elected abbot; he died in 1914. The present abbot is D. Anselm Catalan. The mission began with 20 acres; it now has 25,000 acres, 6000 being under cultivation. The abbey, with 50 monks, has within its spiritual jurisdiction 16 square miles of territory, and controls 10 churches, 19 religious and 2 secular priests, 12 monastic students, and 23 nuns. The Marist Brothers and the Sisters of St. Joseph have teaching institutions within its territory, which has a Catholic population of 2600.

See Birt's *Benedictine Pioneers in Australia* (London, 1911); Cardinal Moran's *History of the Catholic Church in Australasia* (Sydney, 1895).

E.M.O'B.

New Protection, THE. The customs and excise duties imposed in 1906 were used for an experiment in economic legislation. One of the arguments repeatedly used against a protectionist policy was that high duties enabled local manufacturers to charge high prices for their goods while paying low wages to their workmen. Accordingly Alfred Deakin, who was convinced that under suitable conditions protection must benefit the employee and consumer as fully as the manufacturer, devised a tariff that should deal equitably with all three. He chose for the experiment the manufacture of stripper-harvesters—harvesting machines originally invented in Australia (see RIDLEY, JOHN and MCKAY, HUGH VICTOR) which manufacturers in the United States were endeavouring to 'dump' on the Australian market.

The customs duties on these machines, and on other agricultural machinery of a similar nature, were increased substantially; but power was given to the government to lower the duties by executive action if it were found that local manufacturers were charging prices above those fixed in a schedule to the tariff act. This protected the primary producer, whose welfare was important to the Commonwealth. To protect employees, an excise of half the amount of the duty was imposed on machinery manufactured in Australia, but might be remitted if the manufacturer proved that he was paying 'fair and reasonable' wages—as defined either by parliament or by some federal or State industrial authority.

The experiment with excise duties was carried farther by a provision with regard to the duties on spirits. If a distiller was proved either to have paid less than 'fair and reasonable' wages or to have employed 'more than a due proportion' of boys in his works, he might be penalized with an extra duty of 1s. per gallon. But this punishment could not be inflicted without special parliamentary sanction.

In New South Wales and South Australia manufacturers obtained exemption under an industrial agreement (see INDUSTRIAL LEGISLATION). Victorian manufacturers, however, on applying for exemption, were faced with a scale of wages which they refused to accept, and on appeal to the high court of Australia it was decided that the whole of this excise legislation was unconstitutional, since the Commonwealth's taxing power could be used only for purposes of taxation, not as a remedial agency in other directions. See TARIFFS.

New South Wales, so named by Captain Cook (at first in the form 'New Wales') from a fancied resemblance of its coast-line to that of Wales, originally comprised all the Australian mainland east of 135° E. long. as well as Tasmania and (doubtfully) New Zealand. The separation of various areas to form other colonies (see COLONIES, CREATION OR SEPARATION OF) has reduced its area to 309,432 square miles; this includes Lord Howe Island, but not the Federal Capital Territory, which is 940 square miles.

Natural Features.—These are described in detail under GEOGRAPHY, ECONOMIC. The colony lies wholly in the temperate zone; its western boundary is the 141st meridian, its eastern the Pacific Ocean, its southern the south bank of the Murray River to its source and then a straight line south-eastward to Cape Howe; its northern boundary is more complicated—the parallel of 29° S. lat. to the Macintyre River, thence that river and the Dumaresq to the dividing range, thence along the northern watershed of the Clarence and Richmond rivers to the sea. The coast-line—700 miles from Point Danger to Cape Howe—has few striking topographical features. The river-mouths are usually obstructed by sandbars (see HARBOURS); but there are three good natural harbours, Port Stephens, Port Jackson, and Jervis Bay, into which no important rivers flow. The surface of the colony comprises three well-marked natural divisions, the coastal region, the two tablelands, and the western plains.

The coastal area is a non-continuous strip of low-lying, well-watered country below the steep edge of the tableland; its average width is 30 miles, but in the Hunter-Goulburn valley it widens to 150. Its rivers are numerous, short, and rapid (fall about 70 feet per mile), rain-fed and therefore liable to floods. Along the more important (the Richmond, Clarence, Macleay, Hunter, and Shoalhaven) lie fertile alluvial lands all suitable for dairying, and, on the Richmond and Clarence, for sugar-growing. The tablelands, which run roughly parallel to the coast from end to end of the State, are separated by the encroachments of the Hunter valley on the east and the Namoi-Peel on the west. They comprise an extensive series of uplands varying from 30 to 100 miles in width and reaching a maximum height in the Kosciusko plateau in the south (highest point 7328 ft.). They present a steep escarpment towards the coast and a gradual slope towards the western plains. Within the southern tableland are situated the Jenolan, Wombeyan, and Yarrangobilly caves (see LIMESTONE CAVES). The plains, which extend from the base of the tablelands to the western boundary of the State, slope gently towards the Darling, and are interrupted by (*a*) the Grey and Barrier ranges near the western boundary and (*b*) a line of elevated country, extending from Orange to Cobar, which serves as a watershed for some of the Lachlan and Darling tributaries. The Darling-Murray basin, a network of inland rivers, covers in New South Wales an area of 230,000 square miles.

Climate.—The mean annual temperature is 59.5°, the mean summer and winter temperatures 68° and 44° respectively. North of Port Jackson the coastal climate is hot and 'muggy' during the summer months; on the western plains it is hot and dry; the tablelands are cold in winter, and snow lies on the hill-slopes of the Kosciusko plateau from March to December. The average annual rainfall along the coast varies from 70 inches in the north to 30 in the south; on the tablelands the average varies from 30 inches in the north to about 25 in the south; on the plains the 15-in. isohyet runs approximately from Barringun on the north through Bourke, Cobar, and Mount Hope to a point west of Moama on the Murray. In the far west the rainfall is 10 inches at Wilcannia and between 8 and 9 at Broken Hill.

History.—The first European settlement in New South Wales was made by an expedition sent from England under the command of Captain Arthur Phillip (see TRANSPORTATION for the object, and FIRST FLEET for the voyage out). Phillip's instructions were to found the settlement on the shores of Botany Bay if the country was suitable; on his arrival there in January 1788, he decided that its many swamps and other defects made it extremely unsuitable. Thereupon with three boats he proceeded to explore an inlet somewhat to the north which Cook had named Port Jackson, and without hesitation chose it. On 7 February, all the members of the expedition being assembled, the royal commission was read by Judge-advocate Collins, and Phillip became

Captain-General and Governor-in-Chief in and over our territory called New South Wales extending from the Northern Cape or extremity of the coast called Cape York in the latitude of ten degrees thirty-seven minutes south to the southern extremity of the said territory of New South Wales or South Cape in the latitude of forty-three degrees thirty-nine minutes south and of all the country inland westward as far as the one hundred and thirty-fifth degree of east longitude reckoning from the meridian of Greenwich including all the islands adjacent in the Pacific Ocean within the latitudes aforesaid of ten degrees thirty-seven minutes south and forty-three degrees and thirty-nine minutes south and of all towns garrisons castles forts and all other fortifications or other military works which may be hereafter erected upon the said territory or any of the said islands.

Following this came the reading of the act of parliament establishing the courts of judicature and the patents under the great seal empowering courts to be convened. The office of lieutenant-governor was conferred on Major Robert Ross of the Marines. Governor Phillip concluded the ceremony by addressing the gathering. He thanked the soldiers, and promised rewards to such convicts as merited it and punishment to evil-doers. Flanagan in his *History of New South Wales* (London, 1862) reports a perfervid address alleged to have been delivered by Phillip on this occasion, but there is no historical evidence to support him.

The erection of buildings in the settlement was slow, and the first settlers were forced to remain under canvas for a considerable period. In the meantime the number of sick was increasing, and scurvy was rife. By July, however, huts and a substantial storehouse had been built, a cottage was being erected for the governor on the east side of the Cove, and an observatory on the west side (now Dawes Point); bricks, too, were being made (see SYDNEY). At first a weekly ration, consisting of 7 lb. biscuit, 1 lb. flour, 7 lb. beef (or 4 lb. pork), 3 pints peas, and 6 oz. butter, was served to the soldiers and men convicts, the women convicts receiving one-third less; but by October a reduction became necessary, so that the men's rations were lessened by 1 lb. flour and the women's by a proportionate amount; not until the *Justinian* arrived with a large stock of supplies on 20 June 1790 was the full ration reinstated and the fear of famine dispelled.

Preparations for defence were commenced in July 1788, when a redoubt on the eastern side of the Cove was begun, and on 4 June of that year the King's birthday was celebrated with a salute (see MILITARY DEFENCE). The governor laid the foundations of the first government house on 26 May 1788, and on 4 June, while celebrating the King's birthday, formally named the district round Sydney 'the county of Cumberland,' noting with pride that it was the largest county in the world. The early attempts to cultivate the land and raise stock were not very successful. They are dealt with under AGRICULTURE, CATTLE and SHEEP.

At first there was considerable trouble with the natives, and murders were of frequent occurrence; these in many, if not most, cases were instigated by outrages on the part of the convicts, whose repeated attempts to escape also added greatly to the governor's responsibilities. Some took to the bush, others stole boats and put to sea in the hope of reaching one of the Dutch islands in the Malay Archipelago. One of these parties—two men and a woman in an open boat—did succeed in reaching Timor, but were imprisoned and sent back to Sydney. The attempts to escape by land usually ended in death in the bush or return to the settlement. Nor was it the prisoners only who troubled the governor exceedingly. Shortly after the first landing he had requested the officers of the prison-guard to encourage diligent prisoners at least with a few kind words, but to threaten with punishment those whom they saw idling or met straggling in the bush. But Major Ross and his officers objected; they were not concerned, they said, in promoting order and good conduct among the convicts. They were sent out on garrison duty; their official instructions were comprised in a letter sent from the admiralty to commanding officers of marines at Portsmouth and Plymouth, and they would govern themselves by that letter, and not by any requests they might receive from Phillip. They had been called upon to sit as unpaid members of the criminal court; as Phillip did not see his way to pay them, they declined to sit, or to interfere in any way with the convicts except those who were immediately employed for their own convenience, or when they were called out at the head of their men. Only Phillip's tact, good temper, and self-control prevented a violent outburst. Ross, who took every opportunity of being aggressive, was, for that matter, on no better terms with the judge-advocate or his own officers, and the constant disturbances and disputes were not ended until he was sent to Norfolk Island as lieutenant-governor.

Phillip's commission gave him power to establish courts of judicature, both civil and criminal. The first criminal court was held on 11 February 1788, and its punishments were prompt and terrible; though the court was supposed to administer justice 'according to the laws of England,' its procedure was carried out in a strictly military fashion. Under the anxieties and worries of his office Phillip's health gave way, and he sailed for England on leave on 11 December 1792. During his term he had displayed great qualities, never failing to meet sensibly and energetically the numerous difficulties which arose. In a vast country he had been set, with the most unpromising materials, to lay the foundations of a colony, establish the machinery of civil government, provide for the administration of justice, develop the resources of unexplored territory, and maintain friendly relations with the tribes by which he was surrounded. The population ruled by him, and composed largely of the worst elements of society, had increased to upwards of 4000, about a quarter being settled in Norfolk Island. To meet their wants a town had been built at Sydney, and smaller settlements established at Norfolk Island, Parramatta, and Toongabbie, around which 1500 acres of land had been brought under cultivation. Explorations (see EXPLORATION BY LAND) had been pushed, largely by the governor in person, to the line of the Hawkesbury and Nepean. Australia has seen no greater achievement than Phillip's. On his return to England he was granted a special pension of £500 a year for his services. For further details of his career see PHILLIP, ARTHUR.

Discontent among officers and men of the marines, and their desire to go home at the expiration of their term of service, made the British government decide to relieve them by raising a corps, to be called the New South Wales Corps, specially for the work of guarding the convicts. The first detachment reached Sydney on 26 and 28 June 1790, but the commander, Major Francis Grose, did not arrive until 14 January 1792. The last detachment of marines embarked for England on board H.M.S. *Gorgon* on 16 December 1791. After Phillip's departure the affairs of the colony were administered by Major Grose as lieutenant-governor from 11 December 1792 to 17 December 1794; Grose then returned to England and Captain William Paterson took his place until 11 September 1795. Grose's administration of civil affairs was characterized by military forms and procedure. He handed over the exercise of magisterial functions to officers of the Corps—one of his first acts being to transfer the magistracy at Parramatta from the justices of the peace to Captain Foveaux. In acting thus he was disobeying instructions; he must have either misunderstood his commission and the letters patent, or have

regarded the employment of justices as within the governor's discretion. When reduced rations were issued owing to a failure of crops in 1793, he abandoned Phillip's practice of equal distribution and made the convicts' ration of flour and rice only half that issued to the rest of the population. He gave large land-grants to both civil and military officers; one of the first officers to receive a grant was John Macarthur, who in 1794 had 250 acres under cultivation at Parramatta. Grose allowed ordinary settlers one or two convicts, supported at the public expense, to assist in the cultivation of land, whereas each officer was given ten and in many cases more. This was not approved of in England, as subsequent instructions showed. During his term of office Paterson did not in any way alter the system Grose had established; he merely 'carried on' till he was relieved.

When it became known that Phillip's health would not permit him to return, Captain John Hunter, R.N., who was then serving on board Lord Howe's flagship *Queen Charlotte*, applied for and obtained the governorship. He assumed office on 11 September 1795, and at once found himself involved in difficulties. The settlement, he complained, was in anything but a flourishing condition; there was scarcely a pound of salt provisions in the store, and no tools of tillage; the military force was insufficient; there was not a barn, granary, or private storehouse in the settlement; finally, he was short of convict labourers and could not carry out necessary public works. He asked for fully 1000 more male convicts, as he could scarcely collect 20 for any public purpose at Sydney, so entirely had they been assigned to the military and civil officers and the principal citizens. In December 1795 he complained further that he had not an article of clothing in the store. Supplies received a year later were soon exhausted, and in September 1798 the people were, 'literally speaking, nearly naked and great numbers without a bed or blanket to lie upon.' No further supplies arrived; the convicts worked in the fields almost as naked as the aborigines, and convicts in the transports *Ganges*, *Britannia*, *Barwell*, and *Hillsborough* arrived with no clothes but those they stood in. The soldiers of the Corps, too, gave the governor trouble. Their officers owned themselves powerless to prevent them from fraternizing with infamous characters, and Hunter suggested to the British authorities (uselessly, at the time) that the Corps should be relieved every three, four, or five years as other garrisons were. A system, introduced by Grose, of purchasing for public use the produce of officers' farms, while it helped to tide over many a period of scarcity, was ultimately the cause of incalculable mischief, for many of the officers soon paid more attention to commerce than to their professional duties. Hunter frequently and bitterly complained of this, and on 1 June 1797 told the British government that

> this spirit of trade, which I must ever consider in the manner it is carried on here to be highly disgracefull to men who hold in their hand a Commission signed by his Majesty, has been carried on so far that it has now reached all the inferior appointments, so that it has absorb'd all their time and attention, and the public duty of their respective offices are entirely neglected, to the no small injury of his Majesty's service.

Although Hunter had so much to complain of, it is clear that he firmly believed in the ultimate prosperity of the settlement. He brought out a number of free settlers, mostly agriculturists, and the settlement expanded during his term of office (see AGRICULTURE and CATTLE). The summer of 1798-9 was remarkable for the first protracted drought on record; for ten months scarcely a shower fell. Then followed a disastrous flood in the Hawkesbury River, which overflowed its banks and swept away the government store and all the provisions it contained. It rose to more than 50 feet above its usual level, and carried all before it—settlers' houses and furniture, live stock and provisions; 'the whole country looked like an immense ocean.'

Explorations by land and sea under Hunter's governorship are narrated under their proper headings, but it may be noted here that in his time the Hunter River and its coal-mines were discovered and worked, a settlement being founded where Newcastle (q.v.) now is. The population of the colony was increased by the frequent arrival of transports with convicts; up to June 1800 37 vessels in all arrived, with about 5000 on board, of whom a little over one-fifth were females.

Hunter's recall was brought about by a quarrel with John Macarthur (q.v.). He was succeeded by Captain Philip Gidley King on 28 September 1800, and on his return to England was granted a pension of £300 per annum. The new governor was not more comfortable than his predecessor in his relations with the Corps. The officers were importing rum, and had even set up stills in defiance of a government order. King was specially ordered to put a stop to this traffic, but was not very successful; he created a storm of indignation among the importers, and greatly embittered the officers, by refusing to allow some thousands of gallons to be landed. The most important events of his term were the initiation of the wool industry (see SHEEP and WOOL), the settlement in Tasmania (q.v.), and the issue of the first Australian newspaper. A revolt of convicts took place among the chain-gangs working on the road to Windsor, near Castle Hill, which although unimportant in itself, revealed to King how dependent he was on the Corps which so constantly gave him trouble, and he begged to be allowed to resign. On 13 August 1806 he was succeeded by Captain William Bligh, a martinet specially chosen with a view to putting down with a strong hand the trade in spirits, in which officers of the Corps still persisted. Accordingly, in February 1807 Bligh issued a general order drawing attention to the evils that had been produced by the trade and prohibiting the exchange of spirits or other liquors in payment for grain, meat, wearing apparel, or any other commodity; but the struggle continued throughout the whole period of his governorship.

When Bligh took office the settlers on the banks of the Hawkesbury and Nepean were suffering from the results of disastrous floods, and his dispositions to relieve them were regarded as infringements of the interests of the private traders. Of these Macarthur was one, and this and other differences eventually led to the illegal deposition of Bligh by the officers of the New South Wales Corps (see BLIGH, WILLIAM). Major Johnston administered the government until Lieutenant-colonel Foveaux returned from England, and Foveaux in his turn was relieved by Colonel Paterson. The government recalled the Corps and sent the 73rd regiment to succeed it, with its lieutenant-colonel, Lachlan Macquarie, as governor. Macquarie's

instructions were to send Johnston to England for trial by court martial and to put Macarthur on his trial before the criminal court of the colony.

Macquarie entered on his long and arduous governorship on 1 January 1810. He could not reinstate Bligh, who was still in Tasmania: it was equally impossible to arrest Macarthur or Johnston, who had gone to England in March; but Macquarie published his instructions to show that the British government supported Bligh, arranged that the Corps should leave for England on 10 April, reinstated the officials whom Macarthur and Johnston had suspended, and cancelled all grants of land or stock that had been issued. Having done this, he proceeded to soothe public feeling by such acts of leniency as were possible. Grants issued in the ordinary course, not as rewards for rebellion, were renewed, and the dismissed officials were protected against malicious and vexatious legal actions. When Bligh came back to Sydney he was helped to obtain evidence against Johnston in all legitimate ways, but his attempts to arouse public feeling were discountenanced. He sailed for England in May, and the colony settled down again (see MACQUARIE, LACHLAN).

New South Wales now entered on a stage of progress. The establishment of schools in which children were not only taught to read and write, but also instructed in useful handicrafts, was followed by a marked improvement in morals. Churches and public buildings were erected, asylums founded, and the better tone given to society generally by the governor was materially aided by his high-minded wife, who laboured to improve the condition of her sex and the children in the colony.

One feature of Macquarie's policy, however, met with much opposition from settlers and military. This was the favour with which he treated 'emancipists' (q.v.). Scarcity was not unknown during this period, and in 1814 the price of bread was fixed by the magistrates at 13½d. for the 2-lb. loaf. In the same year the public stores were relieved of one drain upon their resources by an order from England that the issue of rations and fuel to the families of civil servants (as well as the practice of allotting to each a government servant clothed and victualled at the public expense) should be discontinued. Other privileges of the same sort were cancelled in 1815.

Macquarie's greatest work was his encouragement of exploration and the spread of settlement. In 1811 he visited Hobart and rearranged the system of government, bringing under one head the northern and southern settlements. In 1812 he turned his attention to the extension of settlement in New South Wales, which was still hemmed in by the ranges that had stopped Phillip; it was due to his active support that Blaxland (q.v.) and Evans (q.v.) in 1813 broke through the mountain barrier and opened up the western plains (see EXPLORATION BY LAND and BLUE MOUNTAINS). Macquarie himself crossed the range to fix the site of Bathurst. Journeys of discovery by John Oxley, the surveyor-general (q.v.), and Hamilton Hume (q.v.), an Australian-born settler, also extended the partially-known area of New South Wales from the 2000 square miles or so of 1810 to over 100,000 square miles—from Port Macquarie in the north to Jervis Bay in the south, and inland about 400 miles. The area of actual settlement was also much extended by Macquarie's road-making and bridge-building, and the safety of the settlers was increased by his flood-prevention works in the Hawkesbury valley.

The system of judicature was altered in 1814, a supreme court being established in Sydney with a judge appointed by the Crown. Two magistrates appointed by the governor were to aid the judge. Over all was the court of appeal, presided over by the governor himself, with the judge-advocate as an assessor. No change was made in the criminal court, where the judge-advocate presided (see CONSTITUTIONS). The first judge of the new civil court was Jeffery Hart Bent (q.v.), an overbearing lawyer with whom Macquarie quarrelled almost at once. His refusal to admit to practice an attorney who had been a convict embittered the quarrel and resulted in his never sitting as judge in a case. He was therefore recalled in 1816, to be succeeded by Barron Field (q.v.).

The foundation-stone of a new hospital was laid by the governor on 30 October 1811. To get it built he bargained with three settlers—D'Arcy Wentworth, Garnham Blaxcell, and Alexander Riley—that for building it they should have a monopoly of the sale of spirits for three years (afterwards extended to four). The contractors made great profits, and the colonial office disapproved of the bargain and forbade Macquarie to repeat such experiments (see HOSPITALS). The first bank (the Bank of New South Wales) was established in 1817. The governor's secretary became president of the board of management, and D'Arcy Wentworth and Thomas Wylde held seats on the board (see BANKING). A savings-bank was established in June 1819, Barron Field, James Erskine, Judge-advocate John Wylde, and Sir John Jamison being the first trustees (see SAVINGS BANKS).

By his support of emancipists Macquarie made many enemies, and they were not long idle. Between his dismissal from office and his return to England, Bent made himself a centre of opposition, and complaints went to England. The colonial office began to feel that some investigation was necessary, and in January 1819 J. T. Bigge (q.v.) was appointed a commissioner to enquire into the state of New South Wales. He spent 17 months in the colony, doing his work with great care, and presented three reports to parliament in 1822 and 1823. He did not like Macquarie's pro-emancipist policy and thought him extravagant over public works, but bore witness to the excellence of much of his administration. Macquarie, already tired of the quarrels in which he had become involved, had in 1817 proffered his resignation, which was accepted in 1820; his successor, Sir Thomas Brisbane, arrived in November 1821, and Macquarie left in the following February.

Brisbane, like Macquarie, was a soldier; but his choice did not mean the continuation of the military autocracy which had in Macquarie's time been legitimate. Bigge's reports were known to foreshadow the initiation of a civilian form of government, leading up step by step to representative institutions; and Brisbane (who was attracted to the position by the possibilities it offered of astronomical study under new conditions) left the administration almost entirely in the hands of the permanent officials until Bigge's recommendations were published and carried into effect. In 1823 the machinery of government was remodelled by the New South Wales Judicature act (4 Geo. IV cap. 96), which put an end to autocracy

QUEENSLAND
NEW SOUTH WALES
VICTORIA
SOUTH AUSTRALIA
PACIFIC OCEAN
SOUTH PACIFIC OCEAN
Dirranbandi
Coondoo
Stanthorpe
Kyogle
Tweed Heads
Murwillumbah
Byron Bay
Ballina
Casino
Lismore
Richmond River
Clarence River
Maclean
Grafton
Tenterfield
Mungindi
Macintyre River
Fort Grey
Tibooburra
Milparinka
Hungerford
Barringun
Enngonia
Wanaaring
Fords Bridge
Bourke
Warrego River
Culgoa River
Bokhara River
Narran River
Barwon River
Brewarrina
Walgett
Collarenebri
Pokataroo
Moree
Warialda
Glen Innes
Inverell
Bingara
Tingha
Narrabri
Barraba
Guyra
Dorrigo
Coffs Harbour
Bellingen
Armidale
Uralla
Walcha
Tamworth
Werris Ck
Quirindi
Gunnedah
Coonabarrabran
Coonamble
Castlereagh River
Namoi River
Lake Frome
White Cliffs
Tarrawingee
Wilcannia
Lake Poopelloe
Cobar
Nyngan
Warren
Gilgandra
Coolah
Murrurundi
Scone
Merriwa
Gulgong
Muswellbrook
Singleton
Maitland
Cessnock
Newcastle
Port Macquarie
Camden Haven
Taree
Gloucester
Dungog
Port Stephens
Lake Macquarie
Tuggerah Lakes
Hawkesbury River
Gosford
Windsor
Richmond
Sydney
Parramatta
Liverpool
Campbelltown
Camden
Bulli
Wollongong
Kiama
Broken Hill
Silverton
Cockburn
L. Menindee
Lake Cawndilla
L. Tandou
Victoria Lake
Darnick
Ivanhoe
Mt Hope
Condobolin
Peak Hill
Parkes
Forbes
Orange
Eugowra
Canowindra
Lake Cargelligo
Lake Cowal
Hillston
Lake Poputaja
Lake Victoria
Wentworth
Mildura
Griffith
Leeton
Cootamundra
Wyalong
Grenfell
Cowra
Barnedman
Temora
Young
Burrowa
Crookwell
Goulburn
Mossvale
Bowral
Berry
Nowra
Kiama
Crookhaven Heads
Jugiong
Narrandera
Balranald
Oxley
Booroorban
Jerilderie
Wagga
Gundagai
Tumut
Yass
Canberra
Queanbeyan
Braidwood
Batemans Bay
Moruya
Bodalla
Cooma
Bermagui
Bega
Bombala
Eden
Twofold Bay
Green Cape
Cape Howe
Mt Ellery
Murray Bridge
Swan Hill
Lake Tyrrell
Lake Albert
L. Hindmarsh
Barham
Deniliquin
Finley
Tocumwal
Culcairn
Holbrook
Tumbarumba
Albury
Echuca
Corowa
Murray River
Murrumbidgee River
Lachlan River
Darling River
Bordertown
Serviceton
Kingston
Bendigo
Ballarat
Melbourne
Commonwealth Territory shown thus
Railways shown thus
Railways under construction thus
Scale of Miles
0 50 100 150

by giving the governor a legislative council of from five to seven nominees; he could disregard its advice in times of emergency, but must at once submit the dispute to the authorities at home. A supreme court of the British type was established, trial by jury was tentatively introduced, and provision was made for appeals and courts of quarter sessions. The first legislative council, appointed in August 1824, consisted of the lieutenant-governor, the chief justice, the colonial secretary, the principal surgeon, and the surveyor-general; at the same time Brisbane was asked to let the British government have the names of ten merchants or landholders whom he thought worthy of a place on the council, and on his successor's arrival some of these were appointed. Francis Forbes (q.v.) was transferred from a similar position in Newfoundland to be the first chief justice of Australia, and took his seat on 17 May 1824.

The character of the colony was also being revolutionized. Brisbane greatly encouraged the immigration of free settlers, with the result that a number of young moneyed men arrived in the colony, became squatters, and soon made it possible to break up the costly government farms, and to supply the wants of the community with cheaper and better produce. The increased quantity and better quality of wool produced during this period, and the knowledge that free settlers would be welcome, further stimulated immigration; the formation in England of such associations as the Australian Agricultural Company (q.v.) familiarized British capitalists with the notion of investing money in the development of Australia. Settlement of the fertile areas round Bathurst, Goulburn, and Singleton dates from Brisbane's governorship. For the explorations of the period, which were far-reaching and important, see EXPLORATION BY LAND and EXPLORATION BY SEA. Their chief practical results at the moment were the transfer of the penal settlement at Port Macquarie to the newly discovered district of Moreton Bay, and the occupation in 1824 of Melville Island in the far north in order to secure for Britain the possession of all Australian territories within easy reach of the Dutch settlements in Malaysia.

In 1825 the population of the colony was 33,675; there were 237,622 sheep and 134,519 cattle; 45,514 acres of land were under cultivation, and 411,600 lb. of wool were exported. The revenue raised in the colony was £71,682, but a large expenditure devolved upon the crown, which even in 1821 amounted to £425,350.

Brisbane was succeeded by Major-general Ralph Darling (1825-31) a successful but conservative staff officer. His unfortunate controversy with the press has been given so large a place in history that the development of the colony during his administration is frequently overlooked. The legislative council was enlarged to include non-official members, and the first steps were taken to establish a modern judicial system with trial by jury. Expenditure on the convict system, chargeable to the British government, was differentiated from ordinary colonial expenditure, which was met largely by local revenue. Darling was an able administrator and effected the reorganization of departments necessitated by the increasing population and the extension of free institutions. He created a land board to deal with applications for grants, established a department of customs and a regular postal service, and reformed the currency by reducing it to a sterling basis, thus freeing commerce from one of the trammels of the past. Despite the economic set-back in 1827-8 due to drought and over-speculation, the immigration of small capitalists increased from 485 in 1825 to 2016 in 1829; the demand for labour exceeded the convict supply, and private experiments were made in the introduction of labourers under contract. In 1826 settlement was extended in the coastal district, the Illawarra being formally occupied by the despatch of a garrison to Wollongong, and a land-grant at Port Stephens was made to the Australian Agricultural Company; in 1830 the rich hinterland of Port Macquarie was opened to free settlement, the convicts being removed to a new penal establishment at Moreton Bay. More important for the pastoral industry (then the chief source of wealth) was the opening up of the interior by squatters and explorers. Darling was responsible for sending Charles Sturt (q.v.) on the expeditions of 1828-9 which led to the discovery of the Darling River and the exploration of the lower Murray, and during his administration the Darling Downs, in what is now Queensland, were discovered. He checked the ambitions of the emancipists and ruled the convicts harshly; conditions in the road-gangs became worse and many escapees took to bush-ranging, which became a serious nuisance in 1829-30 and was suppressed with difficulty. His continuous controversy with the emancipists and their associates, the native-born, led to his recall.

Bourke, Darling's successor (1831-7), was a liberal and popular man of affairs who for six years succeeded in keeping clear of the exclusive-emancipist quarrel, and was thus enabled to devote his attention to problems of development. Before he took office a fundamental change had been made in the land system, land-grants being abolished and sale by auction substituted, the upset price being fixed at 5s. per acre. So popular was colonial investment that the sale of land increased rapidly during Bourke's administration, the figures being: 1832, 2086 acres; 1833, 29,025; 1834, 91,399; 1835, 271,947; 1836, 389,546; 1837, 370,376. In addition to the land thus alienated large stretches of the western plains were occupied by squatters without permission; Bourke was sensible enough to realize that squatting could not be prevented while the pastoral industry proved so lucrative, and decided to regularize occupation by the issue of pastoral leases. The number of sheep increased from 600,000 in 1829 to 2,750,000 in 1838, and the export of wool from 973,330 lb. in 1830 to 4,606,915 lb. in 1837. There was also an increase in cattle until the end of the thirties, when the home market was supplied and the price fell. This pastoral development was partly at the expense of agriculture, the cultivated area in New South Wales being only 93,000 acres in 1838 as against 108,000 acres in Tasmania, where the yield per acre was twice that of the mainland. The increasing demand for imported foodstuffs is shown by the following figures, 1836 being the peak year:—

Year.	Wheat. bushels.	Flour. lb.	Barley. bushels.	Rice. lb.
1832	44,908	30,072	977	88,052
1836	263,956	4,385,550	27,567	474,358
1837	114,464	1,522,658	7,034	176,030

Pastoral development created a great demand for labour. When the new land system was introduced it was decided to set apart some of the land-fund to assist the migration of

of the said corps for 365 days, as also a state of the subsistence p.d'm.

H.M. is also pleased to direct that the major and capt'ns shall each raise their own comp's, receiving for each approved recruit the sum of three guineas, by which arrangement the charge of raising 300 men (including the serg'ts, corp'ls, and drum'rs) will amount to £945.

Subsequently it was determined that a fourth company should be raised in New South Wales from marine volunteers and officered by a captain and two lieutenants of marines; vacancies could be filled from among the best conducted convicts. This additional company was raised in 1792, and the command given to Captain George Johnston.

Of the personnel of the corps nothing very good can be said. Some of the officers already held commissions—Grose was a half-pay officer of the 96th, Nepean was a marine, Hill came from the 6th regiment, Paterson from the 73rd, Macarthur from the 68th, Foveaux from the 60th, and Fenwicke and Marton from the 22nd. The others came from the militia or from civil life. But it is hardly to be supposed that, at a time when so many opportunities for advancement were offering, officers with soldierly ambitions would have been content to abandon European service for garrison duty in a penal colony, had not private reasons (generally, no doubt, of a financial nature) made such a change desirable. The rank and file consisted principally of men who had made other regiments too hot to hold them, of civilians to whom any change of environment was a welcome one, of prisoners from military penal establishments, and, in some cases, of convicts from English gaols. Writing to Major Grose before the departure of the corps, Sir George Yonge says of one of them:—'It has been represented to me by Major-Gen'l Picton that William Jameson, late a soldier in the 12th Reg't of Ft., who, having been sentenced to death, was pardoned on the condition of serving for life in the corps under y'r C. (command), then actually embarked for N.So.Wales, has been seen at large on shore, and has even appeared at the parade of the 12 Reg't, in which he had committed a crime of so heinous a nature as to have forfeited his life.' It may easily be supposed that Private Jameson was not the only recruit who enlisted for Botany Bay as the lesser of two evils.

Curiously enough, although the past history of many of the privates was well enough known, the officers resented any reference to it. When King in 1803 wished to attach to the corps five conditionally-pardoned convicts whom he had enlisted as a bodyguard, Johnston—then in command of the corps—declared indignantly that it would degrade the corps to have convicts in its ranks. But the use of the corps—and of similar corps in other colonies—for the reception of mutineers or criminals from regiments of the regular army was apparently an understood thing. In 1809 there is record of the despatch of a mutineer from the Indian army to be permanently enlisted in the corps; what is stranger, in 1811-13 deserters from regiments in the Peninsula were still being sentenced to service for life in the corps, although it left New South Wales in May 1810 and had been converted into an ordinary line regiment. It would be interesting to know what happened to these culprits when they reached the colony.

The behaviour of the corps in New South Wales was on the whole better than might have been expected from its origin and composition. Of the men very few complaints were made. King on several occasions emphasized his approval of them: 'the utmost order and regularity,' he wrote on 1 March 1802, 'has uniformly prevailed among the non-commissioned officers and privates.' One incident is enough to prove the corps' efficiency. When the convicts mutinied at Castle Hill on 4 March 1804, the Sydney companies left their barracks near Sydney Cove about 1 a.m., reached Parramatta at 4 a.m., and after a 20 minutes' halt spent the rest of the day in chasing the rebels—probably covering at least 40 miles (Johnston claims 45). Such a performance in hot weather is one that any regiment might be proud of, then or now. Macquarie also, just before he sent the corps back to England, took occasion to praise its discipline and 'orderly good conduct' in the highest terms. Of the officers no good report can be made. They quarrelled with governor after governor; when Phillip went home on leave and they were in power, they used it to destroy all his carefully laid plans for the growth of the town, which they disfigured by taking up allotments where they chose and forcing the roads into crooked courses. Their trading, especially their traffic in 'rum' (i.e. spirits of any kind, more particularly those distilled from wheat), was an unceasing scandal (see CAMPBELL, ROBERT and RUM, TRAFFIC IN); and it was they who led the corps into the mutiny against Governor Bligh with which its name will always be unfavourably associated. The immediate consequence was that Macquarie, on his appointment as governor, received orders to ship the corps (including 'every officer') back to England. It had in 1809 become the 102nd regiment, and left Port Jackson on 12 May 1810, returned to England via Cape Horn (the only British regiment that has circumnavigated the globe), and in January 1812, while stationed at Guernsey, was placed under command of Charles Napier. 'The state of discipline in that corps' ran his letter of appointment, 'requires that you should join it without loss of time.' In June it was ordered to Bermuda, and under its new commander improved in every respect (except in regard to its drinking habits), having the fewest men in hospital of any regiment there. Napier made it an excellent force, but had no opportunity of testing it in battle; it left Bermuda for garrison duty at minor stations, and in 1818 was disbanded.

Not yet, however, was it quite dead. From among the privates with long service Macquarie selected enough to bring up his own regiment to within 19 of its full establishment, and enlisted another 100 as a 'veteran' or 'invalid' company for garrison duty in New South Wales. In 1817 its members were past their prime, and Macquarie reported that 25 real soldiers would be more efficient than the whole company; it was, however, still nominally in existence in 1822 and was not finally disbanded until 1823. Meanwhile the war office did not know what to do with the disbanded units of the 102nd, many of whom seem to have cherished happy recollections of the colony. Accordingly in 1825 volunteers were called for among them to reconstitute the New South Wales Corps, and a body of men under that title reached Sydney on 8 July 1826 and was put under command of Colonel Dumaresq, Darling's brother-in-law; it, too, is sometimes called 'the Veteran Corps,' or 'the Royal New South Wales Veteran Companies.' In 1829 it numbered 3 captains, 3 lieutenants, 10 sergeants, 11 corporals, and 130 privates, and was distributed among seven stations in New South Wales, one at Norfolk Island, and two in

Tasmania. The *Monitor* of 20 February 1830 announced its dissolution; but, according to the *Australian Almanac* of 1832, at the beginning of that year it still contained 54 officers and men. Its final disbandment seems to date from 1 April 1833. J.H.M.A.

New Zealand up to 1841. Closely as New Zealand has always been associated with Australia, its history has run a very different course. This is due partly to geographic and climatic differences, and partly to the very different type of inhabitants whom the white men found there. The Maoris, whom the first settlers found occupying in some strength the greater part of North Island and the northern part of South Island, are far from being mere wandering savages like the Australian aborigines. They are a branch of the great Polynesian race, which had at no very early date (probably about the 13th century) displaced an earlier race akin to the Moriori of Chatham Island. Divided into fairly strong tribes, the Maoris cultivated the soil, fished, and built large sea-going canoes. Both mentally and physically they rank high amongst barbarian tribes. They were continually engaged in war among themselves, and, though they were still in the stone age, had brought the science of fortification to a high pitch, as the remains of their pas (fortified villages) show. Fighting was literally meat and drink to them, for they were inveterate cannibals.

Much of the early history of New Zealand is made up of quarrels and wars between Maoris and invading white men. A special source of trouble was the fact that the English settlers were quite ignorant of the Maori law of *tapu* (things sacred or forbidden). By acts that seemed innocent to them they often quite unwittingly outraged the deepest and most sacred feelings of the Maoris, and aroused a desire for revenge. Some visitors, like Cook and Marsden, tried to understand and to respect Maori feeling; only too many despised what seemed to them irrational prejudices—and did so often to their cost. Further, except in the east of South Island New Zealand had not the large areas of open pasture lands, easily and rapidly occupied by sheep and cattle, that are found in Australia. Where it was not cultivated by the Maoris, the country was for the most part covered with forest, scrub, or fern.

It is possible that New Zealand was sighted by Portuguese or Spanish navigators at an early date; but there is nothing to prove that any part of it had ever been seen by a European navigator before Tasman's voyage of 1642. On 18 December 1642 Tasman anchored in Golden Bay. Next day the Maoris came out in canoes, attacked a Dutch boat, and killed three men. Tasman promptly made sail from the place, which he called Murderers' Bay; he suspected the existence of Cook Strait, but was prevented (he said) by contrary winds from making sure; so he sailed up the west coast of North Island and past the Three Kings, not landing anywhere. He called the new land 'Statenlandt;' the name was altered to New Zealand a little later, when it was proved that it could not be connected with Statenland near Cape Horn.

The next European visitor was James Cook (q.v.), who first sighted the coast on 7 October 1769, spent nearly six months in a circumnavigation, and sailed for the mysterious New Holland on 1 April 1770, after taking formal possession of South Island. A little after Cook's first landfall (on 16 December 1769) the French navigator De Surville anchored in Manganui harbour. The Maoris received him kindly, but he suspected them of stealing a boat, burned their village, and kidnapped a chief, who died on the voyage. In April 1772 another French navigator, Marion du Fresne, who had sailed from Mauritius on a voyage of discovery with the ships *Mascarin* and *Marquis de Castries*, visited New Zealand. For a time all went well, but on 12 June Marion and 16 of his men, who had gone ashore to cut spars, were killed by the Maoris, as were several men who went in search of them. The reason for the massacre is not known, but it has been conjectured that the French cut *tapu* trees. Crozet, Marion's second in command, took stern vengeance, and for a long time afterwards the Maoris remembered with bitter feelings the 'tribe of Marion.'

In March 1773 Cook, on his second voyage, visited Dusky Sound. Six months later nine men from his consort, the *Adventure*, were killed and eaten by Maoris at Grass Cove in Queen Charlotte Sound, and this time the murderers escaped scot-free. In 1777 Cook visited New Zealand for the last time, anchoring in Queen Charlotte Sound on 12 February, and leaving on the 27th. In 1788 Bligh, on his way to Tahiti in the *Bounty*, passed south of New Zealand and discovered the Bounty Islands. Vancouver, who, like Bligh, had been with Cook in 1777, visited Dusky Sound in 1791, on his way to the north-western coast of America. His companion Broughton, who commanded the *Chatham*, discovered Chatham Island away to the east; it was then inhabited by the Morioris, who are supposed to be close kin of the race that inhabited New Zealand before the coming of the Maoris.

On 22 November 1791, the month in which Vancouver visited Dusky Sound, Captain Ebor Bunker left Sydney in the whaler *William and Ann* with the intention of calling at Dusky Sound, but whether he did so is not recorded. In the same month two vessels tried whaling out of Sydney, but met with little success owing to the rough weather. Within the next few years, however, several whaling-ships were working off the coast of North Island.

In November 1792 William Raven—master of the *Britannia*, owned by the Enderbys—came to Dusky Sound to obtain seal-skins for the China market. He built huts for the sealers, and 11 men, with provisions and stores for 12 months, were landed at Luncheon Cove when the *Britannia* left for the Cape of Good Hope on 1 December. On 8 September 1793 Raven returned, accompanied by the *Francis* (the first vessel completed in Sydney), and took off the sealing-gang, which was in excellent health but had procured only 4500 skins. They had in building a vessel of New Zealand pine, which was left at Luncheon Cove; two years later William Bampton found his ship the *Endeavour* (not Cook's ship) leaky, ran her ashore in Dusky Sound, completed the other vessel, named her the *Providence*, and sailed her to Sydney with as many of his crew as she could hold. The *Providence* was the first vessel built in Australasia from Australasian timber, as the *Francis* had been sent out in frame and only completed with Australian timber. On his return Raven gave an excellent report of the timber, especially the pine obtainable at Dusky Sound. In 1794 the snow *Fancy* (Captain Dell) was in the Firth of Thames in the North Island for some time, timber-getting, including 200 trees, from 60 to 140 feet in length, for the

use of the East India Company. This was the beginning of the New Zealand timber-trade. It was not without bloodshed, for the Maoris stole some axes and were fired on, two men and one woman being killed. Raven had a three years' trade licence from the East India Company. In 1795, when whaling became profitable, legislation was passed fixing limits for the southern whale-fishery, and still keeping New Zealand and New Zealand sealing under the dominion of the East India Company. In 1797 the board of trade considered a petition of 'merchant adventurers of the southern whale-fishery' for an extension of limits, and in 1798 the extended limits were granted by legislation. On 30 December 1801 three Enderby brothers and two Champions secured a further extension, which opened the whole southern ocean for fishing, provided the vessels delivered their journals to the directors of the East India Company on returning to England.

In the meantime King at Norfolk Island, anxious to treat the 'New Zealand flax' (*Phormium tenax*) properly, asked Vancouver to induce two Maoris to come over to instruct his people. Vancouver gave instructions to Lieutenant Hanson of the store-ship *Daedalus*, and he went off to the Bay of Islands, beguiled two young chiefs on board, and took them to Sydney, whence Grose sent them on to Norfolk Island. There they declared that flax-dressing was the work of women, not of chiefs; but King treated them with great consideration, learned from them what he could, and then himself took them back to New Zealand in the *Britannia* at the end of 1793. In February 1793 the Spanish explorer Malaspina, with the corvettes *Descuvierta* and *Atrevida*, anchored in Doubtful Sound, but made no important discoveries. In 1800 King, then governor of New South Wales, ordered the commandant at Norfolk Island to send to the Bay of Islands a selection of useful live-stock as a present to Te Pehi, a powerful chief who had been friendly to the English since King had sent back the two young chiefs; and in 1806 Te Pehi and four of his sons visited Sydney and were entertained by King and Samuel Marsden. (See BRUCE, GEORGE.) In 1801 Bass (q.v.) visited Dusky Sound to procure timber for making pork-barrels, and incidentally salved from the wreck of the *Endeavour* a good deal of old iron (his visit to the Sound shows that it was already well thought of for its timber); and when on 5 February 1803 he left Sydney on his last 'pork voyage' his intention was first of all to visit the Sound again and get what was left from the wreck.

Meanwhile the Australian sealing-grounds, in Bass Strait, seemed near exhaustion. In April 1803 Joseph Oliphant, master of yet a third *Endeavour* (a 31-ton schooner this time), after leaving part of his crew on Cape Barren Island went off to Dusky Sound and with great difficulty procured about 2000 skins. In 1804 the whaler *Scorpion* followed his example. Whaling had been carried on off the New Zealand coast since 1794, and occasionally crews settled ashore in the off season (especially along the Bay of Islands), took Maori wives, lived in raupo huts, and grew vegetables and hunted pig; Maoris, too, served aboard these whalers as seamen or harpooners, but were often badly treated. In 1804 an American vessel, the *Union*, while sealing for the China market, discovered the Antipodes group of islands and put a gang ashore there, which after a year's work had collected 60,000 excellent skins. Soon the Snares and Bounty groups were visited for the same purpose, and in 1806 the Auckland group was discovered and added to the sealers' list. The trade thus established (which is separately discussed under WHALING AND SEALING) lasted in full vigour until 1820, but then began to decline, and by 1829 was practically extinct. Whaling for a short time took its place.

One of the early sealing ventures gravely affected New Zealand history. In 1807 the *Santa Anna* (a Spanish prize owned by Lord, Kable, and Underwood) left the Bay of Islands for the Bounty group with a Maori chief, Ruatara, who desired to visit England and see King George. For six months he was left on the Bounties with a sealing-gang, and then taken to England. In London (which he reached in 1809) Ruatara was as far from seeing the king as ever, and fell ill; the master of the *Santa Anna* obtained for him a return passage to Australia by the convict ship *Ann*; and aboard her, ill and miserable, he was discovered by Samuel Marsden, who had come to England to enlist missionaries for New Zealand. Marsden took Ruatara under his charge, nursed him back to health and, when they reached Sydney in February 1810, put him up until a ship could be found to take him back to New Zealand. It was Ruatara who introduced wheat into New Zealand. Marsden, intent on his mission, had brought with him William Hall (a carpenter and shipwright), Thomas Kendall, a schoolmaster (see KENDALL, HENRY), and John King (a flax-spinner), who meant to carry on their religious and secular duties side by side; but almost simultaneously with their arrival in Sydney there came from New Zealand news of a massacre which induced Macquarie to forbid for the time any attempts to settle in the islands. The ship *Boyd*, trading along the north coast for timber, had a certain Tara, a chief of the Whangaroa tribe, among its crew. For some misdoing the master flogged him—a grave breach of Maori *tapu*—and when Tara reached Whangaroa and told of his disgrace the tribe massacred the whole crew except a woman, a boy, and two small children; these Te Pehi, as dominant chief of the district, managed to save (see BOYD, BENJAMIN). The result was unfortunate for Te Pehi; some English whalers burnt his village under the impression that he had joined in the massacre, and Tara's friends killed him for siding with the white transgressors of their law. Not until the end of 1813 did Marsden obtain from Macquarie permission to send his missionaries to New Zealand, and even then he was forbidden to go himself. In March 1814, therefore, he sent off Hall and Kendall in the brig *Active* to get into communication with Ruatara. In August the brig returned with the missionaries, Ruatara, and two other chiefs, and on their favourable report Marsden was given four months' leave and allowed to visit New Zealand. On 28 November he sailed with Hall, Kendall, King, and the Maoris, reached the Bay of Islands on 22 December, preached his first sermon there on Christmas Day, bought 200 acres of land for 12 axes, and left the newly formed settlement for Sydney on 25 February 1815. By 2 August he was back again, bringing with him 22 settlers; this involved the acquisition of more land, but he obtained without difficulty from Hongi (Ruatara's uncle) 13,000 acres at Kerikeri, a good site for a seaport town. The price was 48 axes.

At this time it was estimated that there were from 100,000 to 110,000 Maoris in the North Island. The leading chiefs were Hongi in the

north and Rauparaha at Kawhia on the west coast. Hongi, often described as the ablest man of Maori race, was an ambitious man and a fierce warrior, but he persistently protected the mission settlements. He was determined, however, to master the North Island, and saw that with fire-arms he could do so. Marsden flatly refused to trade in fire-arms. Hongi refused to trade in anything else. When he found Marsden still immovable, he went off to England with Kendall (now a magistrate), was entertained by George IV, and helped in the preparation of a Maori grammar, the vocabulary for which had been obtained in 1818 from two other chiefs, Tui and Titore. The king gave Hongi many presents, including a suit of armour; Professor Lee, the grammar-compiler, gave him money for his aid; the Quakers gave him ploughs and harrows; Marsden's friends gave him watches, tools, clothes, and furniture. When he reached Sydney on his return, he exchanged all these presents (except the armour) for 300 muskets and ammunition; with this precious cargo he hurried back to New Zealand, collected war canoes, surprised a hostile tribe, and slew 1000 men. Small tribes were mown down, and successful expeditions led against others. For five years he continued at intervals these destructive wars; but through all his bloodshed, and despite his disregard of Marsden's admonitions, he always reverenced Marsden himself, protected the missionaries, sent his children to their schools, and when he died told his tribe to 'be kind to the missionaries, for they do much good and no harm.'

Meanwhile the settlement had not been prospering. Marsden had provided a carpenter and a flax-spinner, but, although a good farmer himself, had forgotten to bring farmers or farm-labourers. Ten years after the first cattle had been landed at the Bay of Islands there were only about 30 head there. Most food-supplies were obtained from Sydney or England, and it was 15 years before it occurred to any responsible person that settlers ought to learn to grow their own food. In March 1830 Marsden during one of his periodical visits bought 250 acres of farmland nine miles from the coast; on 3 November 1832 a plough was put in, and soon afterwards a mill was erected and flour ground not only for the settlers but for Maori cultivators. In 1835 Charles Darwin noticed that the farm was flourishing.

Other missionaries visited the North Island, but did not prosper, finding no great chief to protect them. A Methodist colony that had been planted at Whangaroa in 1822 was forced four years later to take refuge at Kerikeri, and returned to Sydney in February 1827. In that year attempts were also made to establish a trading settlement at Hokianga. A New Zealand Company formed in London in 1825, with Lord Durham and Colonel Torrens as promoters, sent out two vessels with a few settlers, who bought land from the Maoris at Hokianga and Manukau but abandoned the enterprise almost immediately; they said the trade was not profitable enough, but the generally believed story is that they happened on a *haka*, heard talk of tribal wars, and thought themselves safer in Sydney. Undeterred by this report, Thomas Raine of Sydney in the same year settled at Hokianga, began to build small craft, and exported spars and flax; two years later he was prospering, and his only complaint was that the Sydney authorities did not feel themselves empowered to put his vessels on the Sydney register.

The exact status of New Zealand at this time was doubtful. Although Phillip had been commissioned to include in his sphere of rule 'all the islands adjacent in the Pacific Ocean,' and King and Macquarie interpreted this phrase to cover even Tahiti, later governors were stricter. Brisbane submitted to Bathurst that a definite decision was required as to the meaning of the phrase, which had been repeated in every governor's commission since Phillip's time; he also asked that 'distinct powers of negotiation, both with New Zealand and the Islanders of the South Seas' should be conferred on him. Bathurst carefully avoided answering the question, but British acts of parliament passed in 1817, 1823, and 1826 definitely include New Zealand among 'islands or countries not within His Majesty's dominions.' It is strange that Brisbane's attention had not been drawn to the act of 1817, which incidentally gave the New South Wales courts jurisdiction over crimes committed by British subjects settled in New Zealand. Though Darling's commission contained the same vague clause about 'adjacent islands,' in Bourke's the wording was altered to 'all the islands adjacent. . . . and also including Norfolk Island'—a phrasing which *a fortiori* excluded New Zealand from the 'adjacent' islands.

About 1829 the disturbed state of New Zealand began to trouble the authorities in Sydney. Rauparaha, who had long since determined to rule central New Zealand as Hongi ruled the northern part, was by 1828 established on Kapiti Island in the mouth of Cook Strait, and from that centre dominated the Wanganui bight and the strait, and ravaged the South Island as he chose. Towards the end of 1830, his uncle having been killed in a raid on Kaiapoi, he persuaded an English shipmaster to aid him in a treacherous attack on the Kaiapoi tribe, after which its chief and his wife were tortured to death; in a later attack the tribe was practically exterminated, and the affair concluded with a cannibal feast. This and similar if less ghastly reports from other districts stirred Darling to urge intervention. He had already, on 12 August 1830, reported that the whaler crews were usually profligate and uncontrolled, that the traders from Sydney connived at the escape of convicts, and that order could only be maintained either by the establishment at the Bay of Islands of an official with a few troops, or by stationing on the coast a small armed vessel commanded by a naval officer. In April 1831 he reported the Kaiapoi outrage: pointed out that, though Rauparaha might have acted 'according to his notions,' the English shipmaster aided in the massacre purely to obtain a cargo of flax; and announced his determination to send an official resident to New Zealand at once and to prohibit the traffic in dried human heads. Collett Barker (q.v.) of the 39th regiment (who had been commandant at Raffles Bay) was Darling's first choice for resident; when he was killed by aborigines at Encounter Bay, Darling suggested Sturt, who happened to be at Norfolk Island. This appointment, however, was postponed on account of Darling's recall, and Goderich, while praising his energy and adopting his suggestions in principle, preferred to appoint a civilian. Almost at the same moment (on 22 December 1831) Bourke and his council decided that any resident would be powerless unless he were backed by troops. In March 1832 Goderich decided to appoint James Busby (q.v.), but to leave him unsupported by troops; he asked the admiralty to detach a small vessel for New Zealand service, but all that could be

obtained was an instruction to the admiral in charge of the East Indies station that occasional visits should be paid by warships.

Busby's position was thus extraordinarily difficult from the beginning. His influence, as he himself wrote, was to be 'altogether of a moral character.' Goderich provided him with a letter from William IV to the chiefs of New Zealand—a candid letter, in which the hope was expressed that 'no circumstances may occur in future to interrupt the Internal tranquillity of New Zealand, which is so necessary to the maintenance of a close commercial Intercourse between the Inhabitants and those of Great Britain.' Bourke gave him long and involved instructions, most of which were impossible of performance without an armed force to back him. He was, said a contemporary, 'a warship without guns.' On 21 April 1833 he left Sydney for New Zealand, reached the Bay of Islands on 16 May, and at once began to confer with the chiefs. The first result was a proposal to establish a national flag for New Zealand; Bourke sent off three patterns, the chiefs (or as many of them as could be got together) chose one, and it was hoisted on 20 March 1834 and saluted with solemnity by the guns of H.M.S. *Alligator*. But this did not in any way aid the cause of peace, and in September Bourke told the colonial office flatly that, unless a warship was permanently stationed in New Zealand waters, he would recommend the recall of the resident and the placing of settlers in the islands outside the pale of British protection.

In December Bourke returned to the charge. Busby, he said, had no naval backing, no legal authority to arrest British offenders; such authority as he had was almost totally disregarded by Europeans, and did not impress the Maoris. It was, however, mainly the white population that gave Busby trouble. When in May 1834 his house was attacked, although he did not discover the culprit until October, yet as soon as the discovery was made fourteen chiefs assembled, made a fifteenth confess his guilt, and declared his land forfeit to the British king. In the face of this action the repeated assertions of the colonial office that Busby had failed to obtain the chiefs' confidence are shown up as an attempt to evade its own neglect to provide him with any support.

In 1835 trouble of a new kind arose. An adventurer of French parentage, but with British military service to his credit, who styled himself 'Charles, Baron de Thierry,' had in 1822-3 bought from chiefs through Thomas Kendall a few hundred acres at Hokianga, and had asked Bathurst for British protection in case he founded a colony there. Bathurst having replied that New Zealand was not a possession of the British crown, the Baron applied for French protection, was again refused, and dropped the scheme. In 1835, however, he turned up again. He had conceived a plan of extraordinary magnificence, considering its date; he proposed to dig a canal across the Panama isthmus, annex New Zealand, make himself king of it, and establish a fortnightly mail service across the Pacific from Panama via Tahiti to the Bay of Islands, Sydney, and Hobart. New Zealand, it may be noted, was to pay for the canal. The mail service was to be started in August 1835, without waiting for the construction of the canal. In May he petitioned the British crown for aid and protection in this enterprise; in September he had reached Tahiti on his way to his new kingdom, and thence notified Busby of his intentions. Busby acted promptly; he called a meeting of chiefs (mostly from the districts immediately surrounding the Bay of Islands), and persuaded them to constitute themselves a federation, 'The United Tribes of New Zealand,' self-governing but under British protection. Unfortunately he imported into this declaration of independence a clause interfering with the right of individual districts to prohibit the importation of ardent liquors, and this greatly disturbed both Bourke and the authorities in London, so that the scheme for British protection fell through. In 1837 the Baron reached Hokianga with 93 followers. Most of the chiefs openly denounced him as a pretender, but one recognized his claim to the Hokianga land, and finally gave him 1000 acres, on which he settled down. In the same year a Roman Catholic missionary, Father Pompallier, was despatched from France to labour among the Maoris, and in 1838 he settled at Kororareka with two priests. A little later the Nanto-Bordelaise Company was formed to found a colony at Akaroa in the South Island, on land provisionally purchased by one Langlois, master of a French whaler, on 2 August 1838.

All this movement on the part of France drew the attention of the British government to the necessity for securing in some way a definite hold on New Zealand. Yet there might have been more delay had not Edward Gibbon Wakefield (q.v.), fresh from his activities on behalf of South Australia, in 1837 turned his attention to the islands, obtained the co-operation of Lord Durham, and formed the New Zealand Association. After long argument and an attempt in 1838 to pass a bill through parliament, the scheme fell through. But in 1839 Wakefield and his friends took matters into their own hands, formed a New Zealand Company (with a capital of £100,000) for colonizing the territory on Wakefield lines, sold in London 100,000 acres of land that was not yet bought in New Zealand, and chartered a ship, the *Tory*, which left England in May 1839 with a first batch of settlers under the leadership of Wakefield's brother William. This direct action at last roused the colonial office to establish British authority in New Zealand. On 15 June the boundaries of New South Wales were officially extended to include such portions of New Zealand as the crown might acquire, and Captain William Hobson (q.v.) was despatched to New Zealand as lieutenant-governor.

William Wakefield reached Queen Charlotte Sound in August, and went to work at once. His orders were to be frank with the natives, to make no bargains without being sure that all the owners were approving parties and that each received his due share of the purchase-money, and to see that all transactions were thoroughly understood by the chiefs and the tribes at large. He disregarded these instructions altogether. Fearing missionary interference, he hurriedly bought land from chiefs (or even from inferior men) without reference to the tribes; the land mentioned in his documents stretched beyond the possessions of the tribes with whose members he dealt; he did not even assure himself that any man signing his documents knew what the documents meant. A whaler named 'Dicky' Barratt, who knew a little Maori, explained a few points clumsily to the chiefs: that was all. Moreover, he made payments in fire-arms and ammunition. In the price of 20 million acres which he claimed

to have bought in the Wellington and Taranaki districts were included 239 fire-arms, 81 kegs of gunpowder, and 2 casks of ball cartridges, besides nightcaps, pipes, Jews' harps, and sealing-wax.

Hobson, meanwhile, had reached Sydney, consulted Gipps, and drawn up a proclamation announcing that no purchase of land in New Zealand would be recognized without enquiry and ratification by British land commissioners. Then he went on to the Bay of Islands, proclaimed the foundation of the colony, and called the chiefs together at Waitangi, where Busby lived. There, after a full explanation and two days' discussion, was concluded on 6 February 1840 the famous treaty of Waitangi, the first clause of which yielded to the Queen of England 'all the rights and powers of sovereignty' which the chiefs had in their districts; the second guaranteed to the tribes 'full and undisturbed possession of their lands,' and provided that, if they were sold, the first offer must be made to the British government; the third gave the Maoris all the rights and privileges of British subjects. Armed with this well-discussed and thoroughly understood treaty, Hobson next demanded particulars of all land-claims urged by Europeans. He found that they amounted to more than half the area of the islands. Out of a total of 72,000 square miles claimed by self-styled purchasers, 68,000 had been purchased in the last two years. The land commissioners soon discovered how preposterous many of the claims were. The New Zealand Company was only one of many powerful claimants; W. C. Wentworth (q.v.) and a Sydney syndicate had obtained large grants in the South Island from five petty chiefs who visited New South Wales. But Gipps stood by Hobson, and the Sydney speculators lost their claim.

Hearing that a French expedition had been despatched by the Nanto-Bordelaise Company to occupy Akaroa, Hobson on 21 May 1840 proclaimed British sovereignty over all the islands of New Zealand, had the proclamation repeated during June at ports in Middle (South) and Stewart islands, and on 22 July sent off H.M.S. *Britomart* with two magistrates aboard her to hold formal courts at Akaroa and other ports, so that the annexation could not be objected to on the ground that British authority was not being actually exercised. This was done at Akaroa on 11 August. Meanwhile the French expedition, accompanied by the French warship *L'Aube*, had reached the Bay of Islands on 11 July, and had been informed of the proclamations of May and June. It reached Akaroa on 15-16 August, and the French settlers were allowed to land and occupy (after paying the full price agreed on) the land that Langlois had purchased; in the end the Nanto-Bordelaise Company was allotted 30,000 acres, but could not keep its settlement alive, and sold out to the New Zealand Company for £4500. For a full discussion of this episode see Andersen's 'Mission of the *Britomart*' in the *Transactions* of the New Zealand Institute, vol. lii.

It was not the French but the British would-be settlers who gave Hobson most trouble. They resented his interference with their land-claims, despised or disliked his friends the missionaries, and objected strongly to the superior authority of Gipps, who invariably and rightly backed Hobson. The company's settlers clamoured for the land that had been sold to them in England. The company said that Hobson was withholding it, and appealed to Gipps, who agreed to allow it about one part in a hundred of its claimed area. Then action was taken in London, where the ministry in office was weak and the company's friends (Lord Durham especially) were strong. On 3 May 1841 New Zealand was severed from New South Wales, thus getting rid of Gipps. Hobson was made first governor of the new colony, but with definite instructions from London to allow the company an area in proportion to its expenditure, calculated at the rate of five shillings per acre. This increased the area at its disposal from 110,000 acres (Gipps's award) to 1,000,000. The company, emboldened by so easy a victory, went on to demand that it should have the power to select this amount anywhere it liked, and to call on Hobson to arrange the purchase of its selected blocks; but just then a new ministry came into power in England, Durham and his friends found themselves without influence, and Hobson, abiding strictly by the treaty of Waitangi, was able to administer the colony's affairs without succumbing to overmuch pressure from avaricious and unscrupulous white claimants. The rest of his term of office, however, belongs to the history of New Zealand as a colony, and so lies outside the sphere of this volume.

Nichols, George Robert (1809-1857), son of Isaac Nichols (q.v.), was born at Sydney on 27 September 1809 and educated in England. On his return to Australia he was articled to the crown solicitor, and on 1 July 1833 admitted to practice in New South Wales—being so far as is known, the first native-born Australian admitted. He practised in both branches of the profession, since they were not separated until 1834. During the 1830s he was closely associated with Wentworth and Bland in the Patriotic Association (see Wentworth, W. C.), in 1840 was part-proprietor and editor of the *Australian*, and in 1848 was elected to the legislative council for the Northumberland boroughs, which constituency he represented until its dissolution in 1856, and then in the legislative assembly until his death. In 1856 he became auditor-general and secretary for lands in the first ministry. He died on 12 September 1857.

Nichols, Isaac (1770?-1819), was transported to New South Wales in 1791, but was soon freed, and became a successful farmer. In 1796 Hunter appointed him overseer of convict gangs in Sydney. In 1799 he was convicted of receiving stolen goods, and sentenced to 14 years on Norfolk Island; Hunter, however, considered that there had been a miscarriage of justice—due, it was alleged, to personal spite—and suspended the sentence until the evidence had been reviewed in England. There the matter was neglected until December 1801 when, after repeated reminders from Hunter, the home office granted Nichols a free pardon. He was released on 13 June 1802, became a shipowner, landowner, and assistant to the superintendent of customs, took sides against Bligh, and in April 1809 was authorized by Paterson to act as postmaster for the colony (see Posts and Telegraphs). In 1810 Macquarie continued him as postmaster and appointed him superintendent of convicts, a position which he resigned in 1814. He died on 8 November 1819.

Nicholson, Sir Charles (1808-1903), born at Bedale in Yorkshire on 23 November 1808, studied medicine at the university of Edinburgh (M.D., 1833; hon. D.C.L., Oxon., 1857; hon. LL.D., Cantab., 1868; hon. LL.D., Edin., 1886) and in 1834 came to New South Wales

to practise his profession. In 1843 he was returned to the legislative council for the Port Phillip district, and in 1848 and 1851 for the county of Argyle. From August 1844 to May 1846 he was chairman of committees, and speaker in May 1846-June 1848, May 1849-June 1851, and October 1851-February 1856. He was a nominee member of the first legislative council of Queensland, and became its first president, but resigned on 28 August 1860. Meanwhile he had become closely associated with the cause of higher education in the colonies. He took a prominent part in the founding of the university of Sydney, of which he was elected vice-provost in 1851, and delivered the inaugural address at the official opening on 11 October 1852. He was provost from 1854 to 1861 and chancellor in 1861-2; the office was the same, but its name was altered in 1861. During two visits to England he secured for the university a grant of arms from the college of heralds in 1857 and a royal charter in 1859. In 1857 he presented to the university its museum of Egyptian, Etruscan, Greek, and Roman antiquities, and the stained-glass western window in the Great Hall, and in 1867 established a medal and annual prize for Latin verse, from the accumulations of which a Nicholson scholarship for Latin was founded in 1924. In 1862 he settled in England, where he died on 8 November 1903, leaving to the university of Sydney a munificent bequest of books and manuscripts. (Kt. Bach., 1852; Baronet, 1859.)

Nicholson, WILLIAM (1816-1865), born at Lamplugh in Cumberland on 27 February 1816 and educated at Whitehaven, became clerk in a Liverpool fruit depot in 1836 and in 1841 migrated to Melbourne, where he set up as a grocer. His business prospered and he became a prominent citizen, helping in 1850 to found the Anti-transportation League of Australia, and in November of that year being chosen mayor of Melbourne. As Mayor he signed in July 1851 the announcement of the discovery of payable gold in Victoria. In October 1852 he was elected by North Bourke to the legislative council, and in 1853 was a member of the committee that drew up the Victorian constitution. In December 1855, when the first electoral bill under this constitution was being discussed in the council, Nicholson carried a resolution insisting on the use of the ballot; Haines, then premier, resigned; Nicholson was unable to form a new ministry (he does not seem to have tried very hard); Haines, returning to office, announced that he would disregard the resolution —and Nicholson, returning to the attack, forced him to accept it by successive amendments in committee (see BALLOT, VOTING BY). Nicholson then visited England, where he was welcomed in 1857-8 as 'the father of the ballot' by Cobden, Bright, and John Stuart Mill. Reaching Melbourne again in July 1858, he was in January 1859 sent to the legislative assembly by the Murray electorate and in August of the same year by Sandridge; in October he defeated the O'Shanassy ministry and took office himself, with James McCulloch as treasurer and James Service as minister for lands, but was ousted in November 1860 by Richard Heales (q.v.). In 1862 he joined O'Shanassy's second ministry, but without portfolio. In 1864 he became paralysed, and died at St. Kilda near Melbourne on 10 March 1865.

Nickel. See MINERALOGY.

Nickle, SIR ROBERT (1786-1855), was born at sea on 12 August 1786, received his education at Edinburgh, and entered the army in the Royal Durham Fencibles (ensign, 1801; lieutenant, 1802; captain, 1809; brevet-major, 1819; lieutenant-colonel, 1825; brevet-colonel, 1848; major-general, 1851). In 1806, while a lieutenant in the Connaught Rangers, he took part in the disastrous expedition against Buenos Aires, and on 2 July 1807 was severely wounded while leading a forlorn hope. Returning to England, he was sent to the Peninsula in March 1809, and took part in nine general actions—Talavera, Bussaco, Torres Vedras, Vitoria, Pyrenees, Nivelle, Nive, Orthez, and Toulouse (where he was again badly wounded). After the war he commanded the light company of the 88th. In June 1814 he sailed with his regiment to America, where he took part in the battle of Plattsburg and was wounded at the crossing of the Savannah River. In June 1830 he sailed to the West Indies with the 36th regiment and acted as governor from July 1832 to March 1833. In 1838 he served at the outbreak of the rebellion in Canada. In 1853 he was appointed commander of the forces in Australia, reached Sydney in 1854, and was stationed first at Sydney and later at Melbourne, where he had to deal with the goldfields disturbances at Ballarat. Arriving at the diggings just after Captain Thomas had captured the Eureka Stockade (q.v.), by his calm judgment and humane demeanour he restored peace and dispersed the rioters. His health having suffered through exposure, in 1855 he applied for leave to return to England, but died, while still awaiting permission, at his house at Jolimont (Melbourne) on 26 May. (K.H., 1838.) J.V.C.-B.

Nicotiana, a genus of the family Solanaceae, entirely American, with the exception of one somewhat variable species endemic in Australia. This is *N. suaveolens* (Native Tobacco), which ranges across the continent, but is chiefly

Native Tobacco.

found in the interior. It is an erect biennial herb, with white (or greenish) sweetly-scented tubular flowers; fruit a dry capsule. It grows luxuriantly on sandhills in the Riverina district of New South Wales, and in the early days the leaves were made into a sort of tobacco. Stock eat it readily when mixed with other herbage, although chemical investigation shows that, if eaten alone in quantity, it contains sufficient nicotine to poison them.

Nightjar. See FROGMOUTHS AND NIGHTJARS.

Nixon, FRANCIS RUSSELL (1803-1879), son of Robert Nixon of Foot's Cray in Kent, an early patron of the painter J. M. W. Turner, was born on 1 August 1803, and educated at Merchant Taylors' school and St. John's College, Oxford (B.A., 1827; M.A., 1841; D.D., 1842). After a period of parochial work in Kent, he was on 24 August 1842 consecrated in Westminster Abbey first bishop of Tasmania, and was enthroned in St. David's church at Hobart on 27 July 1843. His diocesan administration was not marked by any outstanding development of church work, but he was a good musician, a pleasing artist, and an eloquent preacher. To enable him to visit the outlying parts of his diocese he secured a 10-ton yacht; in 1849 four convicts ran away with it and, after a remarkable voyage across the Pacific, reached California. Their leader apologized by letter to the bishop for the theft, explaining that only necessity had driven him and his companions to it. In 1863 Nixon resigned the bishopric, returned to England and, in recognition of his work in Tasmania, was appointed in 1864 to a rectory in Yorkshire; this, however, he held for a year only. He died on 7 April 1879 at his home on Lago Maggiore in Italy. Among his many published works are: *Lectures on the Church Catechism* (London, 1860); *Transportation: a Communication to Earl Grey* (Launceston, 1848); *The Cruise of the Beacon* (London, 1857); *Twelve Views in Adelaide* (Adelaide, 1845).

Noble, MONTAGU ALFRED, born in Sydney on 28 January 1873, first played for his colony in 1894, and in 1898 made his appearance in test cricket in the first Melbourne match against Stoddart's eleven. He took part in 39 test matches consecutively, making his last appearance at the Oval in August 1909 as captain of that year's Australian team. He won fame first as a bowler, heading the Australian test averages in 1898 with an average of 20.29, and his bowling remained throughout his career a great asset to the Australian teams; he bowled 1169 overs in all, taking 115 wickets (an average of 24.78), a record only excelled by Trumble's 141 wickets for an average of 20.88 (Giffen bowled more overs for fewer wickets, and Spofforth and Turner had better averages for considerably fewer overs). His batting was less evenly excellent; in 1899 and in 1903-4 he ranked second (to Hill in the one case and Trumper in the other), but in other seasons was much lower down the list. In 68 test-match innings he scored 1905 runs, an average of 30.72. Outside test cricket he has been a great run-getter in Sheffield Shield matches, having an average of 65.81—4976 runs in all; he also took 169 wickets, at an average of 22.01. His bowling was right-hand with medium pace, deceptive flight and swerve, and a break from the off. See CRICKET.

J.C.D.

Noddy. See GULLS, TERNS, AND SKUAS.

Nonda Tree. See PARINARIUM.

Norfolk Island lies in the western Pacific in lat. 29° 4′ S. and 167° 58′ E.; it is about five miles long and three miles wide, and has an area of a little over 13 square miles. The coast-line, except on the south-west, consists of inaccessible cliffs washed by a heavy surf; the surface is mainly tableland, from which Mount Cook rises to a height of 1000 feet. The island was discovered by Captain Cook on 10 October 1774 and named by him 'in honour of the noble family of Howard.' The island was uninhabited, and Cook and his men were probably the first who ever landed on it. Cook noticed that the flora was similar to that of New Zealand. The most important tree is the spruce-pine, an *Araucaria* intermediate between the pines of New Zealand and those he had seen in the New Hebrides. The history of the island since its discovery falls into three periods, with an interval between the first and the second. From 1788 to 1808 it was a branch of the penal settlement at Sydney. It was then left unoccupied till 1825, when it was set aside mainly for the reception of 'colonially convicted' criminals (i.e. those who incurred fresh punishment for misdemeanours committed in New South Wales). In 1855 the penal settlement was abolished, and in the following year the inhabitants of Pitcairn Island (see BOUNTY, MUTINY OF THE) were transferred to the island.

First Period (*1785-1808*).—Early in 1785, about the time when the Matra-Young proposals for the colonization of Botany Bay were being discussed by the British government, speculators applied to the East India Company for leave to establish on Norfolk Island a factory from which the Indian marine could be supplied with cordage; they suggested that the island might also become a centre of the Alaskan fur-trade, a half-way house to China, and an outpost against the Pacific possessions of Spain. Alexander Dalrymple, the company's hydrographer, in July of that year condemned the project vigorously, alleging that its real object was to establish a smuggling trade-centre in the company's domain—which theoretically extended from the eastern coast of Africa to the western coast of America. It is probable that Dalrymple's chief desire was to attack indirectly the proposals for settling in New Holland. Nothing came of the speculators' application; but the British government instructed Phillip on 25 April 1787 to settle Norfolk Island as soon as possible after reaching Botany Bay.

On 15 February 1788 Phillip despatched the *Supply* from Sydney under Lieutenant Henry Lidgbird Ball, with Lieutenant P. G. King (superintendent and commandant), James Cunningham (master's mate), Thomas Jamison (surgeon's first mate), six other free men, and nine male and six female convicts—23 persons in all. Six months' provisions and stores were sent with the party, and a four-oared boat was supplied for the use of the officials, who had instructions that no boat over 20 feet in length was to be built on the island. No ships were to call, unless in distress, without a permit, and any vessel driven ashore was to be destroyed. Their live stock consisted of six ewes, three sows, a goat, two boars, four hens and a cock, three ducks and a drake. King had instructions to set about the immediate cultivation of flax, corn, cotton, and other plants, the seed of which was supplied; great expectations had

been formed with regard to cotton and flax, but nothing came of them. On her way the *Supply* discovered Lord Howe Island (q.v.) and on 29 February 1788 the north-western point of Norfolk Island, named by King Point Howe, was sighted. Two small islands off the south-eastern shore were named Phillip and Nepean isles; King also named Ball Bay and Anson Bay, Point Hunter, and Duncombe Bay. Late in the afternoon of 2 March a landing was made on a cluster of rocks near the Cascades, which King named Cook's Rocks. On 4 March King climbed and named Mount Pitt; on the 6th, as the weather had moderated, the ship was brought round to Sydney Bay, and by the 8th every one had disembarked and the *Supply* sailed for Port Jackson. By 2 April a storehouse had been built, and King began to clear the north-eastern side of the hill at the head of Sydney Bay, which he named Mount George. On 10 March the dangerous element among the convicts asserted itself. King ordered salt provisions to be husbanded whenever fish or turtle could be obtained, in case the ship did not return with fresh supplies. One of the convicts endeavoured to stir up a mutiny because of this, but King gave him 40 lashes—a wise action, for, though the *Supply* came in sight on 16 July she could not land stores until 6 August. On 13 October the *Golden Grove* transport brought more stores, 21 male and 11 female convicts, a guard of marines, two gardeners (seamen of the *Sirius*), and Stephen Donovan, a midshipman in charge of a boat's crew from the same ship. On 23 November another plot to seize the island was discovered; King put the ringleaders in irons, and gave them from 30 to 50 lashes each. Thenceforward till 1790 the island was quiet, and crops were grown successfully, but not in sufficient quantity to make the settlers independent of supplies from Sydney; bad seasons in New South Wales prevented the regular arrival of storeships, and at the beginning of 1790 famine stared the settlers in the face. Early in March, however, the *Sirius* and *Supply* arrived with supplies, bringing Major Ross to relieve King, who was to return to Sydney and then to England to make a report. The *Sirius* (q.v.) was subsequently wrecked. As soon as the disaster occurred Ross declared martial law, and all private property was placed under lock and key in the public store.

On 24 March King boarded the *Supply* and sailed with news of the disaster to Sydney. At the moment there were on the island free persons, 90; belonging to the *Sirius*, 80; male convicts, 191; female convicts, 100; children, 37; total 498. (The first child born on the island was born on 8 January 1789 and baptized Norfolk.) The quantity of grain and live stock was:—wheat, 250 to 300 bushels; potatoes, 1 acre ready to dig in May; barley, 6 bushels; maize, 130 to 160 bushels; hogs, 44; 3 goats; 1 ewe; a quantity of poultry; and some other stock belonging to individuals. Seldom has a small community gone through such an anxious time as now came to the islanders. Weeks grew into months, and no ship was sighted. The *Sirius* went to pieces on New Year's Day 1791, every useful article having been saved from her. The food ration was gradually reduced. The prisoners often ate a week's allowance at a meal; in consequence some died of starvation, others were executed for thieving from the general store. Fortunately in April Mount Pitt was crowded with birds—the 'mutton-birds' of Tasmania—which went to sea during the day but returned to the mountain to burrow nests during the night; between 2000 and 3000 were killed every night, and the supply did not diminish until July. On 7 August 1790 the *Justinian* and *Surprize* storeships arrived from Port Jackson. The delay had been caused by the loss of the *Guardian*, which had left Sydney almost as badly off as Norfolk Island (see RIOU).

In the meantime King arrived in England on 5 January 1791 and learned that a commission appointing him lieutenant-governor of the island had been sent to Sydney; he therefore returned in the *Gorgon* and reached Norfolk Island on 4 November to find it full of discontent. On 8 January 1791 Ross had issued an order—known as the 'one-acre plan'—by which the convicts were given Friday and Saturday to cultivate a certain proportion of land for themselves, their rations from the public stores to be reduced in proportion as the produce of the land became available to them. The idea was a good one, but Ross did not allow time enough to get it into working order, and King had to modify the system considerably. In 1792 two Maoris, who had been kidnapped to teach Australian settlers how to grow flax, were sent on to Norfolk Island from Sydney. King kept them six months and then sent them home in the *Britannia* storeship, accompanying them himself because of 'the sacred duty that devolves upon Englishmen of keeping faith with the native races, and the desire to see for myself what can be done towards colonising New Zealand.' During his absence the soldiers fraternized with the convicts, and in due course quarrelled; a time-expired prisoner (an aggrieved husband) struck a soldier; King on his return treated the offender mildly, and the troops in their resentment became as dangerous as the prisoners. After a theatrical performance on 18 January 1794 the soldiers assaulted the civilians; some soldiers ran to the barracks, donned their side-arms, and returned threatening reprisals; King had one arrested, and promptly marched the detachment to a distant part of the island under pretence of collecting wild fowl, at the same time forming a local militia of 44 ex-marines and seamen. The government schooner *Francis* arriving just then, King sent ten soldiers and some civilians to Sydney to attend a court of enquiry, which found that the conduct of the soldiers had been 'reprehensible' but recommended them to their commanding officer's clemency. Grose, then in charge of the settlement, ordered King to disband his militia, and complained officially of King's actions, but the colonial office refused to rebuke him except for going to New Zealand without Grose's permission.

Up till now the island had no criminal court. On 24 March 1796 the *Supply* brought King a patent for establishing such a court to try offenders on the spot—a wise step, because the knowledge that summary justice could be handed out tended to keep the more vicious convicts fairly quiet. At the first sittings of the court, in June, a convict was sentenced to death, and his two accomplices to hard labour on Phillip Island, for burglary accompanied by brutal violence. In 1796 King obtained leave of absence on the ground of ill-health, and was relieved by Captain Townson, who was succeeded in November 1799 by Captain Rowley (both of the New South Wales Corps). On 26 July 1800 Major Foveaux was appointed lieutenant-governor. During this period the island was

comparatively tranquil and becoming prosperous. When King left, wheat was being raised extensively, and the population was on the increase; in 1798 a small ship was built, and by 1800 the raising of pigs and curing of pork had become a small industry, but flax-growing proved a failure.

Religion was encouraged spasmodically. Richard Johnson accompanied Philip Gidley King in 1791, and was 'very usefull in marrying, christening, &c.,' but returned to Sydney at the end of the year. In 1793 James Bain, chaplain to the New South Wales Corps, visited the island, but was recalled in March 1794; his place was taken by the provost-marshal, Fane Edge, who carried out 'such parts of the offices of chaplain of this island as he conceived himself authorized to undertake,' at least up to 1798. Marriage and baptism were not among these parts, for in June 1795 Samuel Marsden was sent over to perform those ceremonies where needed; his visits were probably repeated at intervals, for no resident clergyman reached the island until 1801. Charles Haddock, who was appointed to the post by the Society for the Propagation of the Gospel in October 1798, drew part of his salary in advance but did not leave England; in November 1800 his appointment was cancelled. In 1801 King (by this time governor of New South Wales), weary of waiting, emancipated Henry Fulton (q.v.), and sent him to Norfolk Island as resident chaplain, first at 5s. per day, then at 7s. 6d., and (when his action was confirmed by the colonial office) at £96 per annum. Education had been undertaken earlier. In 1792 Thomas Maequeen, previously so employed in England, obtained by good conduct the appointment of schoolmaster; Susannah Hunt at the same time acted as schoolmistress to the girls, and from 1797 onwards each received £10 per annum from the Society for the Propagation of the Gospel.

Foveaux's rule was stern, but conditions required that it should be so. Soon after his arrival he was faced with mutiny (14 December 1800) and only by severe measures was able to subdue it. His successor, Captain Piper, (8 August 1804) seems to have been more lenient towards the better-disposed convicts.

On 24 June 1803 Lord Hobart instructed King that Norfolk Island was to be abandoned and the settlement removed to Port Dalrymple. King ordered Foveaux to prepare a list of free settlers who would volunteer to move in return for a free passage for themselves and their belongings, four acres in Tasmania for every acre they had cultivated at Norfolk Island, and rations and the labour of two convicts for a year after arrival. Out of 180 occupiers of land 40 volunteered, stipulating that they should not be removed till their crops were reaped; but on the arrival of the *Integrity* on 4 August 1804 all but ten backed out of the bargain. King then ordered the establishment to be reduced, and most of the convicts, with half the military detachment, were withdrawn. By the end of 1805 about 250 people had gone, leaving 700 still on the island. Piper induced some free men to try the new colony, and five took up land near York Town in Tasmania, but shortly afterwards shifted to Longford on the South Esk. In December 1805 the *Sydney* brought over George Guest, the first Norfolk Island settler on the Derwent. This dilatory removal did not suit the colonial office, which in December peremptorily ordered Bligh to abandon the island at once; settlers might be allowed monetary compensation not exceeding £1000, and grants in the proportion of two acres for each acre of cultivated land given up; houses were to be erected for them of equal value to those left behind, and convict labour was to be granted in proportion to the value of their estates. Bligh gave them the choice between Port Dalrymple and the Derwent; most chose the latter, some settling at Sandy Bay near Hobart, others at an inland village which they called New Norfolk. Bligh, and Johnston after the mutiny, now set to work in earnest to deport the islanders, and by 2 October 1808 the *Lady Nelson*, the *Porpoise*, the *Estramina*, and the *City of Edinburgh* had landed in Tasmania 202 free settlers, 109 women, 220 children, and 23 male prisoners. For some time after landing they were in great distress owing to bad seasons, their own improvident habits, and other causes. Even then the island was not altogether abandoned, a small detachment of soldiers and a few free settlers and convicts remaining; but within two or three years these were withdrawn, and from 1813 onwards the place was unvisited and unoccupied save by an occasional trader or whaler.

Second Period (*1825-1856*).—In 1824 the colonial office, in pursuance of a policy of segregation recommended by Bigge, determined to revive the station on Norfolk Island as a place of banishment for the worst type of convict—'Capital respites,' wrote Brisbane, 'and other higher class of offences. I could wish it to be understood that the felon, who is sent there, is for ever excluded from all hope of return.' On 6 June 1825 Captain Turton with 34 troops, 6 women and children, and 57 convicts reoccupied the station, which then consisted of totally ruined buildings with innumerable pigs and goats living in them. Major J. T. Morisset, who had been commandant at Newcastle and Bathurst, was made commandant with both civil and military powers, and Darling in 1827 decided the character of the penal settlement by withdrawing all women from the island—'My object was to hold out that Settlement as a place of the extremest punishment, short of Death.' In this he succeeded. For more than twenty years Norfolk Island was persistently described by every visitor in terms of which 'hell' was the mildest. Attempts have been made to cast the responsibility for this on the officials in charge. They were, no doubt, severe disciplinarians, and some of them over-severe; but their conduct was an almost negligible factor in the situation created by the deliberate orders of the British authorities. Two disinterested witnesses, James Backhouse and George Washington Walker, who visited Norfolk Island in 1837-8, testified that the officials were at any rate moderately humane, but had to deal with very bad characters, to whom at times they were compelled to administer severe punishment. Under Morisset the notorious Knatchbull, afterwards hanged for a brutal murder in Sydney, was a ringleader in a serious mutiny. The whole history, indeed, of the island's second period is a series of mutinies. In 1833-4 several prisoners succeeded in escaping from custody. On 21 June 1842, when the brig *Governor Phillip* was leaving the island with convicts whose sentences had expired, the convict crew of the settlement boat boarded the brig, overpowered the sergeant of the guard, and battened the hatch over the captain's cabin and soldiers' quarters; but for the prompt action of the captain, who broke through the partition and liberated

the soldiers after shooting the convict at the helm, they would have taken the brig and escaped in her. The ringleaders were sentenced to death. Incidents of this kind naturally made the officials severe, but the island was always in a pitiable condition, and attempts at reform were frustrated by the constant arrival of new prisoners from England.

Morisset was followed by Major Anderson, and he by Alexander Maconochie (q.v.), who, being a lenient man, reaped no small harvest of trouble; there were more mutinies and more outrages in his time than in any other period. In 1844 the island was annexed to Tasmania, and Maconochie was succeeded by Major Childs, whose failure was even worse; it was not until John Price took charge in 1848 that anything like discipline was restored. But the place was not improved by discipline. An officer in 1847 described it as by nature 'a paradise endowed with choicest gifts of climate, scenery and vegetable production; by art, society or policy, a hell, disfigured by crime, loathsome vice and misery . . . the clanking of irons, the dull echo of the lash, with execrations both loud and deep, make men's flesh creep and fill their minds with horror and despondency.' Officials and judges continually asserted that the system, so far from reducing the number of criminals, really increased it. Yet the island was no worse than similar places in England and in the French penal settlements, and the officials on whom so much odium has been cast by Marcus Clarke and other writers were normal human beings, very often carrying out their duties (considering the times) in a remarkably humane manner.

The number of prisoners during this period varied from 1600 to 2000; most were 'doubly convicted' felons from New South Wales or Tasmania, but prisoners of all grades were sent from England.

Third Period (from 1856 onward).—On 15 December 1852 the colonial office asked Governor Denison to report on a plan for the removal of the convict settlement from Norfolk Island and for its occupation by the Pitcairn Islanders (see BOUNTY, MUTINY OF); this plan was favoured both by the British consul at Raiatea in the Society group, and by Admiral Fairfax Moresby (see MORESBY, JOHN), who was in command on the Pacific station and took a great interest in Pitcairn. Early in 1854 instructions were given for the removal of the prisoners and by 7 May 1856 all had been shipped away; the island was left in charge of three caretakers (convicts), and in June of that year was resurveyed by Captain H. M. Denham in H.M.S. *Herald*. On 3 May the *Morayshire*, a hired merchantman, left Pitcairn with 194 passengers —40 adult males, 47 adult females, 54 boys, and 53 girls—and reached Norfolk Island on 8 June. The Pitcairners brought their belongings with them, and Sir William Denison, by authority of the British government, left for their use 2000 sheep, 450 head of cattle, about 500 pigs, 20 horses, and large quantities of preserved foods and grain. By an order-in-council of 1856 the island was separated from Tasmania, created a distinct settlement, and placed till further orders under the governor for the time being of New South Wales. The governor was given power to make all appointments, laws (subject to imperial orders and regulations), and grants of land; all laws, ordinances, and regulations, civil and ecclesiastical, then applicable to the island, remained in force, subject to alterations rendered necessary by the change of government. The incomers were allowed to use the government buildings, and each family was given an allotment of about 50 acres, but the right of ownership was based on a grant from the crown, and land was held at its discretion. These restrictions were made to protect the Pitcairners from parting too readily with their property. Much trouble has ensued, the community holding that the lands were held in absolute freehold, the government maintaining the literal interpretation of the original terms.

In 1859 ten new colonists were sent out by the emigration commissioners in the *Palmyra*— Thomas Rossiter, who had been master of an industrial school in Hertfordshire, with a family of four, James Darve, a miller, smith, and wheelwright, with a family of three, and H. J. Blinman, a mason and plasterer; Rossiter was appointed schoolmaster and storekeeper. In spite of all the kindly treatment some of the Pitcairners longed for their old home, and in December 1858 two families of Youngs (16 persons in all) grew homesick and returned by the schooner *Mary Anne* to Pitcairn. Five years later (in December 1863) three other families —Youngs, Christians, and a Buffet, altogether 30 persons—followed their example. By 1870 one of the Quintals, a son and daughter of Adams, and a daughter of Mills were the only still living children of the mutineers; there were 32 of the second generation, with their offspring. In recent years the population has been increased by arrivals from Australia and New Zealand.

The government of the island, apart from the order-in-council mentioned above, retained until 1895 the simple form which the Pitcairners had invented for their former home. Governor Loftus in 1884 commissioned Henry Wilkinson to collect data for the framing of suitable laws and to supply information regarding island affairs generally. His report was furnished in October 1885, when the British government offered to hand over the island to New South Wales. On 14 November 1896 Lord Hampden, then governor of New South Wales, visited the island by order of the British government, and by orders-in-council dated 15 January 1897 and 18 October 1900 its government was vested solely in the governor of New South Wales with the advice of his ministry. On 14 August 1902 it was officially notified that Sir Harry Rawson had taken over the administration of affairs, and that the premier of the State for the time being would exercise all ministerial functions in that connection. The governor was expected to visit the island at least once during his term of office.

Authority was from 1855 onwards vested in the chief magistrate, who must reside on the island; but the power of alienating, leasing, and authorizing occupation of lands was exercised by the governor of New South Wales alone. The chief magistrate could suspend an officer and appoint another temporarily in his place, and his court had jurisdiction to punish all crimes and offences (except crimes punishable by death), to adjudge all civil pleas whatsoever, irrespective of the amount claimed or in issue, and to grant probate, etc., in connection with the estates of persons dying possessed of real or personal property in the island. Till 1895 the chief magistrate was elected annually by the residents from among their own number, but in 1896 Colonel Spalding was appointed by the governor; he was succeeded by Charles McArthur King, a grandson

of Governor King, in 1898-1903, and he by Captain Walton Drake, R.N. Drake retired in February 1907, and his successor (Captain S. E. Elliott, R.N.) remained in office till 1 July 1914, when the Commonwealth government took over the island. It is now administered by the department of home and territories through an administrator and chief magistrate.

In December 1925 the population of the island numbered 747. The live stock consisted of 1954 cattle, 663 horses, 144 sheep, 208 pigs, and 5846 poultry. Subtropical fruits thrive well; in 1925 5942 bushels of oranges, 271,600 dozen bananas, and 18,320 lb. of coffee were grown, besides passion-fruit, pineapples, and the produce of thousands of wild lemon and guava shrubs. The export trade, however, is insignificant—in the five years 1921-5 the value of imports averaged £91,659 and that of exports only £28,281. Education is free and compulsory up to the age of 15; it is modelled on the New South Wales system, and administered by the New South Wales department of education at the island's expense. The liquor traffic is prohibited.

Administrators of Norfolk Island, 1788-1853 with date they took charge.

Lieutenant Philip Gidley King	6 March 1788
Major Robert Ross	24 March 1790
Lieutenant Philip Gidley King	4 November 1791
Captain John Townson	22 October 1796
Captain Thomas Rowley	12 November 1799
Major Joseph Foveaux	29 June 1800
Captain John Piper	9 September 1804
Lieutenant T. A. Crane	10 April 1810
. . . . .	. . . . .
Major R. Turton	4 June 1825
Captain Vance Y. Donaldson	17 March 1826
Captain Thomas Edward Wright	19 August 1827
Captain Robert Hunt	26 November 1828
Captain Joseph Wakefield	17 February 1829
Lieutenant-colonel James T. Morisset	26 May 1829
Captain Foster Fyans (acting)	1 January 1834
Major James Anderson	17 April 1834
Major Thomas Bunbury	3 April 1839
Major Ryan	27 September 1839
Captain Alexander Maconochie	1 March 1840
Major Joseph Childs	7 February 1844
John Price	6 August 1846

J.V.C.-B.

Norman, Sir Henry Wylie (1826-1904), born in London on 2 December 1826, in 1842 joined his father in Calcutta, and two years later joined the 1st Bengal native infantry (ensign, 1844; lieutenant, 1847; captain, 1860; brevet-major, 1860; brevet-colonel, 1860; major-general, 1869; lieutenant-general, 1877; general, 1882; field-marshal, 1902). He took part in the Sikh war of 1848-9 and in actions on the Peshawur front, in 1853 became deputy assistant adjutant-general, served throughout the Indian mutiny with marked distinction, and in 1858 published the *Narrative of the Campaign of the Delhi Army.* In 1859 he returned to England on leave and was appointed assistant military secretary to the Duke of Cambridge, but in 1861 was ordered back to India as first military secretary to the government to assist in the reorganization of the army. Thereafter his energies were absorbed in administrative work. In 1870-7 he was a member of the governor-general's council, and in 1878 was transferred to London to be a member of the council of India. In 1883-6 he was governor of Jamaica, and in 1889-95 of Queensland, where no more popular governor had ever held office. In 1893 he was offered the governor-generalship of India, but ill-health made acceptance impossible. In December 1896 he was appointed chairman of a royal commission on sugar-growing in the West Indies, and in 1901 became governor of the Chelsea military hospital at London. He was also a member of the royal commission of 1903 on the South African war. He died at Chelsea on 26 October 1904. (C.B., 1859; K.C.B., 1873; C.I.E., 1878; G.C.M.G., 1887; G.C.B., 1887.)

Normanby, Marquess of. George Augustus Constantine Phipps (1819-1890), second marquess of Normanby, born at Whitby in Yorkshire on 23 July 1819, in 1838 joined the army as ensign in the guards, but resigned in 1847. In 1844 he was appointed deputy lieutenant of Yorkshire. In 1847-51 and 1852-8 he was liberal member for Scarborough in the house of commons; meanwhile in 1851 he had been appointed comptroller, and in 1853 treasurer, of the Queen's household. In 1858 he became lieutenant-governor of Nova Scotia, but resigned in 1863 on succeeding to the marquisate. From 1871 to 1874 he was governor of Queensland, and was then transferred to New Zealand (1874-9) where in 1877-9 he found himself at odds with the premier, Sir George Grey, on the question of appointments to the legislative council. From 1879 to 1884 he was governor of Victoria and during this term of administration was 'politically inconspicuous;' his restricted hospitality was somewhat resented in Melbourne society, but he knew his business as governor too well to rouse animosities. On 18 April 1884 he left Victoria for England, and retired from public service. He died in London on 3 April 1890. (P.C., 1851; K.C.M.G., 1874; G.C.M.G., 1877; G.C.B., 1885.)

North Australia. See Gladstone Colony.

Northern Territory, The. The central section of the northern half of Australia, separated from Western Australia by the 129th meridian, from Queensland by the 138th, and from South Australia by the 26th parallel of latitude. The greater part of the Territory is within the torrid zone, but a strip 2½ degrees wide lies outside the tropics. The low, flat coast-line seldom reaches a height of 100 feet; sandy beaches and mud-flats, thickly fringed with mangroves, are broken by occasional headlands of sandstone, marl, and ironstone. Inland the country is generally destitute of landmarks. From the coast southwards there is a general rise to the vicinity of 17° or 18° S. lat., where higher land forms a watershed between sea-flowing rivers and those of the interior systems. Towards the centre of the continent there is a wide area of considerable elevation, and several mountain ranges, generally with an east-west trend. There are two main climatic divisions—the wet season (November to April) and the dry (from May to October), with regular and uniform changes of weather. Nearly the whole of the rainfall occurs in the summer months. On the coast the rainfall is copious—up to 60 inches annually—but lessens to five or six in the south. The mean temperature during the wet season is about 85° Fahr., during the dry period about 75°. Thermometer readings vary from 56° in winter to 100° in summer. Frosts have been known in the valley of the upper Roper.

The ordinary Australian fauna—marsupials, birds, crocodiles, freshwater tortoises, snakes (mostly non-venomous), and frogs—abound; there are many varieties of freshwater fish and littoral mollusca, and butterflies and beetles are strongly represented. The termite (q.v.)

is the principal pest, but mosquitoes and sandflies are also troublesome, especially in the wet season. Some native fauna are protected by law, and domesticated animals have been introduced. Buffaloes (q.v.) formerly roamed in large herds, but indiscriminate shooting has recently thinned their ranks. The vegetation is North Australian in type, but a number of forms belong to the Malayan and Oceanic regions (see ZOOGEOGRAPHY). The timber-trees are of no great commercial value, but in the coastal regions tropical vegetation grows luxuriantly down to the water's edge. On the wide expanses of plain country in the interior there is little vegetation.

The discovery of Arnhem Land in 1623 by the Dutch, and of other coastal areas of the Territory afterwards, is narrated under AUSTRALIA, DISCOVERY OF, and the coastal explorations of Flinders (1802-3) and Phillip Parker King (1819-20) under EXPLORATION BY SEA. King on his return to England strongly advised the British government to occupy a port—preferably Port Essington—in northern Australia, and later on in the same year (1823) William Barnes, master of a vessel trading in the Dutch islands, suggested to the colonial office a settlement in the Gulf of Carpentaria. In December a committee of merchants trading with the East Indies, who had access to King's report, asked for the establishment of a military and commercial settlement at Port Essington, mainly in order to give British traders a base in the Archipelago independent of the Dutch, whose import and export duties were strongly preferential against all non-Dutch merchants. Earl Bathurst, then secretary for the colonies, was not much impressed by Barnes, but acceded to the request of the merchants, and on 17 February 1824 ordered the despatch of a warship to the north-western coast of Australia to take possession of 'that part of the said Coast contained between the Western shore of Bathurst Island and the Eastern side of Cobourg Peninsula, including the whole of Bathurst and Melville Islands, and the said Peninsula.' Captain J. J. G. Bremer (q.v.) in H.M.S. *Tamar* was sent first to Sydney to pick up troops and stores. On 24 August 1824 the *Tamar* with a detachment of marines, the transport *Countess of Harcourt*, and the government schooner *Lady Nelson* (60 tons), left Port Jackson for the north; the occupying party consisted of two officers and 24 men of the 3rd regiment, a medical officer, a commissariat officer, two storekeepers, and 44 convicts. As the proposed settlement was outside the bounds of New South Wales, convicts could not be forced to go there, but the 44 volunteered. The *Lady Nelson* was ordered to inaugurate trade with the Malay coast. On 20 September the party landed at Port Essington, and Bremer took formal possession of the northern coast of Australia between 129° and 135° E. long. However, no fresh water could be found, so three days later the place was abandoned and the party proceeded to Melville Island. On 24 September Bremer anchored off Melville Island in Cockburn Sound, discovered a supply of fresh water, and decided to form the settlement there. Formal possession was taken on 26 September, the troops and convicts landed, and the erection of buildings commenced. On 1 October the construction of Fort Dundas was begun, and on 21 October (the anniversary of the battle of Trafalgar) the colours were hoisted on the fort and a royal salute from two 9-pounder guns and a 12-pounder was fired. Bremer next visited Bathurst Island, and on 13 November, leaving 30 marines under 2nd-lieutenant Charles Cartwright Williamson, sailed for India. The *Lady Nelson* was left to convey stock and supplies from the islands to the settlement. No sooner had the *Tamar* sailed than trouble began with the natives. The *Lady Nelson* was captured by them off Babar Island (200 miles east of Timor) and her crew was murdered; and when at the beginning of 1825 the brig *Stedcombe* under William Barnes landed supplies and sailed under charter to procure buffaloes from Timor, she was captured by pirates off the coast of Timor Laut and burnt. Barnes had stayed at Melville Island, and thus escaped the fate of the crew—who were butchered, with the exception of two boys (Edwards and Forbes). Forbes was rescued in April 1839 by Captain Watson in the *Essington*, Edwards having died about four years previously (see WILD WHITE MEN). Disease soon broke out in the settlement, and before long it became clear that Melville Island was an undesirable town-site. On 19 September 1826 a detachment of the 57th regiment relieved the garrison, arriving in the cutter *Mermaid* and the schooner *Isabella*. At this period the population was 115 males (54 of them convicts), 6 females, and 14 members of ships' crews; the stock consisted of 16 cattle, 23 sheep and lambs, 54 swine, and 16 buffaloes from Timor. Fifty-two acres of land were under cultivation.

So unsatisfactory were the reports of Melville Island that the colonial office decided in 1826 to form a settlement at Raffles Bay, east of Port Essington. The founding of the new settlement was entrusted to Captain James Stirling (q.v.) of H.M.S. *Success*, who left Sydney on 19 May 1827 accompanied by three transports conveying a detachment of the 39th regiment under command of Captain Smyth, and a working-party of convicts. Stirling reached Raffles Bay on 17 June, and placed his settlement on the eastern side of the bay in the vicinity of some freshwater pools. As Melville Island was useless, the troops and convicts were removed to the new site in 1828. On 16 March 1828 the brig *Governor Phillip* left Sydney with Captain H. R. Hartley and a detachment of the 57th regiment to relieve Major Campbell, and on 24 April Captain Smyth was succeeded at Raffles Bay by Lieutenant Sleeman of the 39th. The troops relieved, with four marines and four convicts, returned in the *Governor Phillip* to Sydney. On 15 July Captain Collett Barker (q.v.), with a detachment of the 39th regiment, sailed in the *Phoenix* for Raffles Bay. That settlement, however, was short-lived, for in April 1827 Stirling had reported so favourably on a site at Swan River in Western Australia, that it was decided to form the main settlement there, maintaining merely a trading-station at Raffles Bay. On 28 August 1830 the troops and convicts embarked; on the following day the settlement at Raffles Bay was finally abandoned, in spite of Barker's insistence that it should be retained.

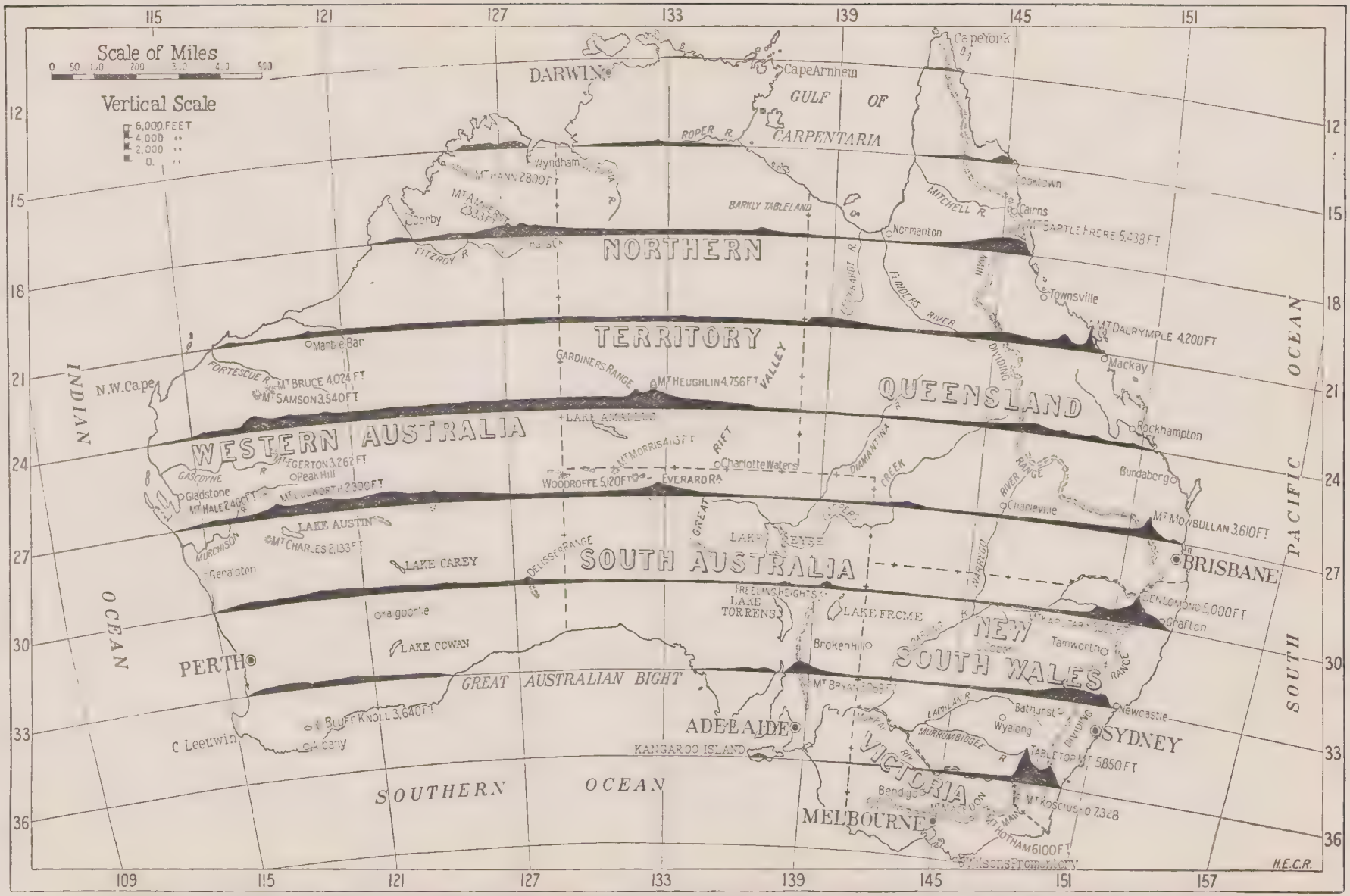
In 1837, rumours that a French expedition was fitting out at Toulon to take possession of some port on the northern coast of Australia reached the British government, and Lord Glenelg ordered another expedition to revisit and re-annex Port Essington. Bremer in H.M.S. *Alligator*, with a detachment of marines under Captain J. McArthur, accompanied by H.M. brig *Britomart* under Lieutenant Owen Stanley, sailed from Plymouth at the end of February 1838; the *Alligator* was disabled in

a heavy gale and was compelled to return. Sailing again on 10 March, she overtook the *Britomart* at Teneriffe, and both vessels reached Sydney on 21 July and refitted for the voyage to Port Essington. Accompanied by a hired transport, the *Orontes*, they sailed again on 17 September, on 20 October reached Cape York (where Bremer landed and took possession of the territory), and on 26 October arrived at Port Essington and anchored in Barrow Bay. A site (now occupied by the town of Victoria) was soon chosen, the troops landed, and the erection of barracks, fortifications, and stores at once commenced. Early in 1839 aborigines informed Bremer that two ships were lying at Raffles Bay, and Lieutenant Stewart was despatched in an open boat to investigate. He found two French ships anchored near Fort Wellington, and the French flag flying over 'two or three' of the abandoned tents on the shore. The vessels were the corvettes *Astrolabe* and *Zelée* under Commodore Dumont d'Urville; they had left Toulon six months ahead of the *Alligator* and her consort, and, when discovered, were surveying the coasts in the vicinity of Bowen Strait. Bremer invited Dumont d'Urville to the settlement, and on 6 April 1839 the ships anchored off Record Point, where they remained three days, afterwards sailing towards the Aru Islands (see EXPLORATION, FRENCH). On 9 July 1839 H.M.S. *Beagle* under Captain J. Lort Stokes discovered the Adelaide River; in October she entered the Victoria River, and a survey was conducted by Stokes and Wickham, who reported favourably upon it.

In 1843 the colonial and land emigration commissioners reported unfavourably on Port Essington, complaining that there was no trade with the Malays who visited the port; that it had been used only by the crew of one shipwrecked vessel; that it was out of the track of passing ships; and that the cost of its upkeep (which up to January 1842 amounted to £16,021) was out of all proportion to its value. It was suggested that the port might be useful as a coaling-station in the event of the establishment of steam communication between Singapore and Australia via Torres Straits; as no steps were taken to establish this service, the admiralty on 6 June 1849 ordered the abandonment of the settlement, and stated that the government would not incur the expense of establishing and maintaining a suggested settlement at Cape York. As a result of this order a select committee of the New South Wales legislative council under the chairmanship of George R. Nichols reported in 1850 against forming a settlement at Cape York or in its immediate neighbourhood. In December 1849 Port Essington was abandoned for the second time, the buildings were destroyed, and the settlers removed to Sydney in H.M.S. *Meander*.

In 1860 A. C. Gregory (q.v.), whose explorations in 1855-6 had disclosed valuable tracts of land in northern Australia, proposed that Queensland should annex a large area south of the Gulf of Carpentaria, and that the rest of northern Australia as far west as the De Grey River should be formed into a new (probably penal) settlement of Albert. The colonial office, just then anxious to relieve itself of as much responsibility as possible, willingly agreed on condition that Queensland should take temporary charge of Albert also. But in 1860-2 South Australia was greatly interested in the northern regions, to which McDouall Stuart was energetically pushing his way across the continent. Since, therefore, Queensland did not want the responsibility of a huge western extension, while South Australia did not want another colony interfering with her hinterland, and nobody wanted to administer the north-western deserts (as they were then considered), in 1863 a compromise satisfactory to every one was reached; Queensland obtained her extension to 138° E. long., the north-west was left in the chaos nominally administered from Perth, and on 16 July the crown annexed to South Australia 'until We think fit to make other disposition thereof, the Territory now known as the Northern Territory.' This added to South Australia—whose name at once became a paradox—523,620 square miles of territory, which the authorities at Adelaide forthwith proceeded to colonize. It was proposed to lay out a town in allotments of half an acre, and to survey country sections of a minimum area of 160 acres; land-orders were to be issued for a total of 250,000 acres of country land at 7s. 6d. per acre, half to be sold in Adelaide, and half in London. A second survey of 250,000 acres was to be made later, and the price per acre was to be raised to 12s. In fact, the ultra-tropical north was to be managed on the most correct South Australian principles. In March 1846 the first land-orders were simultaneously disposed of in Adelaide and London, and all applications not taken up by the general public were bought by companies formed in England and the colony. On 29 April 1864 the government chartered the ship *Henry Ellis*, and appointed Boyle Travers Finniss (q.v.) head of the proposed settlement. The *Henry Ellis* anchored in Adams Bay in June, and Finniss sited his settlement at Escape Cliffs, in spite of the fact that it was 'one of the most inhospitable, unwholesome wastes possible to find. Dysentery, scurvy, fever, and sore eyes became general.' The medical man and the surveying staff in vain pointed out its utter unsuitability; finally the camp broke into open revolt, a party of six seized the only boat and what stores they could and set out for Adelaide, and as a result of their reports Finniss was recalled and retired. The next move of the government was to sell township allotments before survey, each allotment to include a country section of 320 acres, land-orders being given to purchasers upon the understanding that the survey would be completed within a specified date. In December 1868 Surveyor-general G. W. Goyder was sent with a large staff to survey these allotments. Port Darwin was selected as the site of the chief town Darwin—at first named Palmerston—and country selections were surveyed with that as a centre; but, the survey not being completed within the specified time, many holders of land-orders demanded their money back, litigation followed, and the government had to pay in all £73,000. When the survey was at last completed, interest in the Territory had died.

In 1871 the overland telegraph-line (q.v.) was constructed between Port Darwin and Adelaide, and soon afterwards the story reached Adelaide that, while men were sinking holes for the telegraph-posts, gold had been found. Prospecting parties and companies were formed, ships were chartered, and there began 'one of the wildest gold rushes ever made.' The first party (Westcott's) found gold at Yam Creek; then followed finds at Pine Creek, Howley, Bridge Creek, and other places. Innumerable companies were formed, and men, managers, and machinery were sent up to develop the properties.



AUSTRALIA, SHOWING SECTION ON EVERY THIRD DEGREE OF LATITUDE. **(The vertical scale bears no relation to the scale of miles.)**

In most cases the men were engaged for a year, and usually left when their time was up, as tinned food was not to their liking. With this departure of labour the mining industry collapsed, and the one attempt at cultivation—De Lissa's sugar plantation—was on the brink of failure. In 1874 Captain Douglas, the resident at Port Darwin, was commissioned by the South Australian government to engage at Singapore 200 Chinese coolies to save the situation. No intelligence was used in the selection, and most of the imported men were gaolbirds or pirates; but others followed, and by 1880 a comparatively large Chinese population was engaged in mining and the growing of fruit, rice, peanuts and vegetables. A few established a fishing industry. In May 1880 Chinese found gold at the Margaret, on ground that had already been prospected by Europeans, and out of less than an acre many thousand ounces of gold were won.

In 1883 South Australia began to negotiate with the colonial office for a permanent annexation of the Territory; the colony had expended on it £526,137 in excess of revenue received, and was proposing to incur a considerable further expenditure—it was fair, therefore, said the colonial government, that South Australia should have permanent possession of the land. Lord Derby (then colonial secretary) replied that the existing arrangement must stand, but that the Territory would not be made independent of South Australia until in a position to accept responsibility for all moneys spent on it. As it had been alleged that the lack of sound development was due to the costly and inefficient communication between the goldfields and Darwin, South Australia in 1886 made a beginning of a transcontinental railway. At the northern end a line was laid from Darwin to Pine Creek, and a line from Adelaide was gradually extended to Oodnadatta, 700 miles north; this left a gap of 1100 miles, but the colony's finances were drained by developmental works in the south, and at this stage the work had to be abandoned, an attempt to complete the railway by private enterprise on the land-grant system being defeated by strong adverse public feeling.

The coming of federation made it possible to transfer the Northern Territory to the Commonwealth. At first South Australians interested in the potential wealth of central and northern Australia urged the State government to retain the Territory in its own hands and continue the railway northwards at least as far as the Macdonnell Ranges. In 1906, however, negotiations for the transfer were opened, and on 7 December 1907 the transfer was agreed to. A Northern Territory surrender act was passed by the South Australian legislature, and in August 1909 a Commonwealth act—the Northern Territory acceptance act—became law. The Territory was taken over by the Commonwealth as 'The Northern Territory of Australia.' The Commonwealth assumed responsibility for South Australian loans spent on the Territory (a sum of £2,748,062 on 30 June 1909), reimbursing the State the interest paid on those loans, providing a sinking-fund, and paying off the actual deficit; the Commonwealth also agreed to construct a transcontinental railway, purchasing the existing South Australian railway from Port Augusta to Oodnadatta, and completing the line from Oodnadatta to Pine Creek. The total capital thus invested by the Commonwealth in connection with the Territory was:—Public debt on 30 June 1909, £2,748,063; deficit, £779,734; cost of Port Augusta to Oodnadatta railway, £2,242,343; estimated cost of Pine Creek to Oodnadatta line, £4,500,000; total, £10,270,139.

The Territory was formally transferred on 1 January 1911. Immediately radical alterations were made in the administration. Instead of a government resident, an administrator (styled 'His Excellency') and a staff of nine highly-paid officials were appointed. In 1912 a new land policy was framed. At the time of transference there were in existence 265 pastoral leases with a total area of 108,048 square miles —the revenue from them amounted to £6803; there were also 161 pastoral permits, comprising an area of 43,632 square miles and returning annually £2181. The acceptance act had provided that all leases held under South Australian acts should continue on the same terms —an average rental of 14d. per square mile. The new ordinance provided for pastoral leases of 21 and 42 years, rentals being fixed by a board and re-appraised at fixed intervals without taking account of improvements. Leases of agricultural and town lands were to be perpetual; freehold was unobtainable. The first 5000 blocks taken up were to be rent-free for the applicant's lives or for 21 years, whichever period was the longer. Accumulations of leases in single hands were not permitted, and power was taken to resume land for public purposes. Two experimental farms were established, one at Batchelor Farm, near the railway 27 miles from Darwin, the other at Daly River. The completion of the transcontinental railway was not taken in hand for many years, but in 1917 the northern railway was extended from Pine Creek to the Katherine River, and further extensions are now (1926) in progress. Transport from the termini at Oodnadatta and Katherine into the interior of the continent is still performed by camel-train and packhorse, and the cost of carriage is one of the hindrances to settlement. Expenditure has increased out of all proportion to the revenue, and the repeated failure of attempts to carry on tropical agriculture with relatively dear labour has accelerated the financial drift. In 1918 an accumulation of grievances, real and fancied, led to a turbulent gathering outside government house at Darwin which forced the administrator and the judge to quit the country hurriedly. Judge Ewing of Tasmania was appointed a royal commissioner to investigate this riot, and his report of 16 April 1920 was a sweeping indictment of the Commonwealth administration and a condonation of the action of the residents. It also pointed out that whereas under the old regime residents had representatives in the South Australian parliament, they had none in the federal house, and urged that they should be given representation in the Commonwealth parliament. An act of 1923, therefore, allowed the Territory a representative in the house of representatives, who may take part in all debates but has no vote. In the same year a new land ordinance constituted a land board for the Territory, and provided that pastoral leases may be granted for not more than 42 years, the rental being reappraised from time to time; holders of leases under previous ordinances may exchange them for leases under the new ordinance, the rent varying from 2s. to 8s. per square mile. Agricultural lands are classified, and the maximum area for any one lease is: cultivation farms, class i, 1280 acres, class ii, 2560 acres; mixed farming and grazing, class i, 12,800 acres;

class ii, 38,400 acres. Leases are held in perpetuity; the rent for the first period is fixed by the board, and is re-appraised every 21 years. Lessees must stock, fence, cultivate, and build houses as prescribed. Town leases are also in perpetuity; they may be sold by auction or allotted by the board. Lessees must erect within a notified time buildings to the value specified in the conditions of sale. Miscellaneous leases of crown lands may be had for a term not exceeding 21 years. Grazing licences for one year, occupation licences for five years, and miscellaneous licences of one year may be granted by the board. The governor-general may lease to an aboriginal not more than 160 acres of land for any term of years.

Private enterprise has been no more successful than the government in developing the country. In April 1917 extensive meat-works were opened, with plant and buildings costing £900,000. During 14 weeks in that year 19,000 cattle were treated; in 1918 and 1919 operations continued for 16 weeks in each year, the 'kill' in the former year being 29,000, and in the latter 22,000. But labour troubles soon began; demands for higher wages and the introduction of the 'go slow' policy alarmingly diminished the output per unit and so delayed the shipping of the products that it became impossible to induce ships with refrigerators to call. In the end the company was compelled to close down; the works are still idle, and the pastoral industry is at a standstill. As the net result of over 15 years of Commonwealth control, the expenditure of much money, and many attempts to start industries, the Northern Territory is to-day carrying fewer white people, and is less prosperous, than it was half a century ago. In its uninhabited and undeveloped condition it represents an open doorway to Australia.

The total area of the Territory is 523,620 square miles, its length from north to south about 900 miles, and its breadth from east to west 560 miles. All its land boundaries are artificial lines. The eastern boundary reaches the coast near the mouth of the Wentworth River in the Gulf of Carpentaria, the western at Cape Domett, near Cambridge Gulf. The coast-line is about 1040 miles long, giving 503 square miles of area to one mile of coast-line. It is intersected by a number of rivers, many of which —including the Roper, the Adelaide, the Daly,

THE REVENUE AND EXPENDITURE OF THE NORTHERN TERRITORY FROM JANUARY 1911 TO JUNE 1925, INCLUDING THE 1925-6 ESTIMATE

	1/1/1911 to 30/6/1921.	1921–2.	1922–3.	1923–4.	1924–5.	Estimate, 1925–6.	Total to 30/6/1926.
Expenditure—	£	£	£	£	£	£	£
Administration	1,863,039	166,780	162,226	176,456	203,299	243,711	2,815,511
Interest on loans.....	1,470,267	99,429	102,891	101,577	106,461	128,020	2,008,645
Total	3,333,306	266,209	265,117	278,033	309,760	371,731	4,824,156
Revenue—							
Ordinary	876,032	71,679	57,111	59,471	81,812	101,000	1,247,005
Unexpended balance of funds at 31st December, 1910, paid over by South Australia	175,969	...	...	...	...	...	175,969
Total	1,052,001	71,679	57,111	59,471	81,812	101,000	1,422,974
Deficit .....£	2,281,305	194,530	208,006	218,662	227,948	270,731	3,401,182

and the Victoria—are navigable for from 20 to 100 miles. Of the many valuable harbours Port Darwin is equal to any other in Australia. The town of Darwin is laid out with wide and level streets; the buildings, for the most part government offices, are of stone. At Darwin are a cable station and the terminus of the overland telegraph. Agriculture was attempted in 1824, 1827, and 1838, but no extensive operations were begun until the settlement was made at Port Darwin in 1869. In 1871 a few plantations were attempted, but failed owing to the inexperience and extravagance of the planters. In 1879 about 550 Chinese arrived, and fruit and vegetables were soon produced in abundance. In 1884, however, the Resident reported that the condition of agriculture was very disappointing. Subsequently a botanic garden was established in which sisal hemp was grown successfully; it 'nearly overran the garden.' An act of 1890 provided for agricultural leases with the right of purchase, and a number of areas were taken up, but the lessees failed to cultivate their holdings properly. In 1907 provision was made for the taking up of land for mixed farming, and in 1911 experimental farms were established. It has been proved that, given sufficient labour and efficient transport, rice, tobacco, cocoanuts, mangoes, cotton, various fodder-plants, and peanuts can be grown easily (see PEANUTS and RICE).

In 1886 stock was brought to the Macdonnell Ranges from South Australia; six years later cattle were brought from Queensland to the northern areas, and in 1879 2000 head of cattle and 12,000 sheep from South Australia were depastured at the Katherine River. Sheep-raising, however, failed for lack of water. The cattle industry progressed slowly; on 30 June 1925 there were about 855,000 cattle in the Territory, but the closing down of the meat-works in April 1920 had by that time seriously affected the industry, which has also been impeded by ticks and by the difficulty of 'travelling' stock. However, dipping is diminishing the tick-pest, and the sinking of more artesian wells on the stock-routes, and the creation of stock-reserves, is easing the difficulty. Horses thrive well—in 1925 they numbered about 46,000—and 1538 buffalo-hides were exported in 1924-5.

The Territory is rich in minerals, including gold, tin, wolfram, silver-lead, copper, and mica. The presence of coal and of mineral oil is suspected, and on 31 December 1925 licences to search for these minerals, covering an area of 5,256,246 square miles, were current; actual

prospecting, however, has been so far confined to bores put down on Elcho Island. In 1884 pearl-shell was discovered in Port Darwin; the progress of the industry was hampered, at first by local difficulties, afterwards by the outbreak of war in 1914, but during 1924 14 tons of shell was exported to the United Kingdom. The Territory's waters teem with marketable fish, and, despite inadequate transport facilities, a beginning has been made with the export of fish, dried or otherwise preserved; in 1924-5 exports to the value of £1831 went to British Malaya and China.

There is a monthly postal service between the Territory and the eastern States, and State-owned Western Australian vessels give a 60-day service between Fremantle and Darwin. The northern interior receives its mail via Darwin, the southern districts are served from Adelaide via Oodnadatta. The overland telegraph-line is separately described. High-powered wireless stations have been constructed by the Commonwealth at Wave Hill in the Territory and at Camooweal just over the Queensland border. Railway communication is being completed along the Adelaide-Darwin route; but this line serves only a strip of the Territory, and it is proposed to construct another line south-east from Katherine River towards Camooweal in Queensland, with a branch running down the McArthur River to a new port in the Sir Edward Pellew group which will have far better climatic conditions than Port Darwin. This line will open up excellent grazing areas of the Barkly tableland, and give much of the Territory quicker communication with the well-populated areas of the eastern coast.

The total cost of the Northern Territory to the Commonwealth up to 30 June 1926, including the estimate for 1925-6, was £8,766,337. This sum is made up of the indebtedness taken over at the transfer from South Australia, £3,931,086; accumulated deficit, £3,401,182; new works (buildings, roads, bridges, bores, etc.), £472,912; and construction of and capital expenditure on railways, £961,157. J.V.C.-B.

Notelaea, a genus of the family Oleaceae, consisting of seven species of trees or shrubs known as 'mock olives,' endemic in Australia and mostly confined to the eastern States. The flowers are small, the petals connected in pairs by the stamens; leaves opposite and entire; fruit succulent. *N. ligustrina,* a small tree with varicoloured fruits, is the Ironwood of Tasmania. It has a hard, close-grained wood, considered to be a fair substitute for *lignum-vitae. N. longifolia* is the 'coobagum' of the aborigines. It has a very hard timber, and hence is known to bushmen as 'axe-breaker.'

Nothofagus, a genus of trees (rarely shrubs) of the family Cupuliferae. Three species are indigenous. *N. Cunninghami* (Myrtle Beech), a tree usually of 40-50 feet, but occasionally in rich damp valley soil reaching 200 feet, occurs in Victoria and Tasmania; its timber is much used by carpenters, and is very suitable for saddle-trees. *N. Moorei* (Red Beech, Negro-head) is a very beautiful evergreen shade-tree with durable timber. Its habitat is the coastal range of New South Wales in its upper valleys from the Hunter northwards; it attains to 150 ft., with a stretch of 70 feet before the first branch is thrown out. In foliage it resembles *N. Dombeyi,* a Chilean beech, rather than its fellow-

Negro-head.

Australian species. *N. Gunni,* a Tasmanian species, is a deciduous shrub rarely more than 8 feet high.

Nototherium. See PALAEONTOLOGY.

Notothixos, a small genus of the family Loranthaceae; all the species are endemic in eastern Australia. The flowers are minute, unisexual, in small heads on a common stalk; calyx produced into a narrow border. *N. subaureus* is divaricately branched, and the young shoots and under-side of the leaves are clothed with golden hairs. It is a common parasite on the swamp she-oak, and frequently occurs on other parasitic loranths.

Noxious Animals. This article is concerned only with mammals. In Australia the term 'noxious animals' is much misused and misunderstood. The mammals in Australia which may be classed as distinctly noxious are extremely few, but according to various State laws almost any species may be declared noxious within the meaning of some particular act. A typical case is that afforded by section 67 of the Pastures Protection Act of New South Wales, wherein power is given to the authorities to declare any animal in any district noxious, if it is 'found to be detrimental to the stock or pastures thereof.' Or, again, a species may be placed upon a list of 'unprotected' animals, in accordance with powers given under a birds' and animals' protection act, or a game act; it then automatically (though often wrongly) comes to be looked upon as noxious.

The outstanding noxious animals of Australia are the European rabbit, the European hare, the native wild dog, or dingo (*Canis dingo*), domestic dogs which have gone wild, hybrid dogs of many types (produced by the crossing of domestic dogs and dingoes), the European fox (*Canis vulpes*), the domestic cat in a wild state, and the flying foxes or fruit-eating bats (see BATS). Certain marsupials also are regarded as pests at various times and in various places. To the native animals already mentioned may be added the dasyures (such as the tiger cat and the native cat), the wombat, the bandicoots, and certain kangaroos and wallabies (including the paddymelon and the kangaroo-rat). The number of these native animals has, however, so far diminished that they have almost ceased to be pests, except, perhaps, in districts where they have been rigidly protected for a long time.

The *Rabbit,* the worst pest of all, is dealt with in a separate article.

The *Hare*, though frequently amounting to a pest in various places, has never at any time or in any part exercised the same mischief as the rabbit. This is chiefly due to three causes: (1) that it is less prolific than the rabbit, (2) its relative lack of adaptability to greatly varying conditions of rainfall, climate, and food-plants, and (3) its non-burrowing habit. Probably the non-burrowing habit has more to do with its comparative harmlessness than anything else, since it has always been a tolerably easy matter for gunners and packs of dogs to kill it off. Nevertheless the aggregate destruction of pasturage and food-crops wrought by this rodent has been very great, more especially in the eastern coastal districts. The opening up of the North Coast farming areas of New South Wales gave a great fillip to the increase of the hare, but with the rapid spread of population in this quarter there is no danger of the pest getting beyond control.

The *Dingo*.—Though the dingo (q.v.) is found throughout a very large part of Australia, in many parts of the open country it is rare or almost absent. Its great stronghold is in districts containing more or less rugged, hilly, or mountainous country, or contiguous to heavy timber; but numbers are to be found in desert and semi-desert country also. Until recent times they were so bad in the far north-west of New South Wales that they prohibited sheep-breeding over a large section of the country, taking all the lambs as well as many of the grown sheep. At the present time, however, they are to a considerable extent under control in this area, and many sheep are being bred. Taking Australia as a whole, it is probable that there are fewer dingoes now than formerly; but the loss of sheep and lambs through their depredations is still very great. Whereas great stretches of country which once harboured them are now free, there are others in which they were once scarce, but now flourish. This has been brought about by the rabbit, upon which the dingo will feed if opportunity offers. Their onslaught on sheep and lambs has been caused, to a considerable extent, by the great diminution of native wild life which has taken place in the last 30 years. The dingo certainly acts as one of the principal obstructions to rabbits in their attempts to pass through stretches of range or forest country.

In most districts in which dingoes abound, a bonus is paid for their scalps by local authorities or by government. These bonuses may range from about 7s. 6d. per head for pups to £1 for the full-grown dog, but in some cases the same bonus is paid for both. Occasionally as much as £10 is paid by station-owners for the destruction of a dingo whose depredations are extensive, and a local 'bad killer' has brought as high a sum as £50.

Domestic Dog 'gone wild' and Dingo-Dog Hybrids. In addition to the original pure-bred dingo, there are many other wild dogs throughout the Commonwealth. Some of these are town, farm, and station (frequently rabbiters') dogs which have run wild, but in most instances they are hybrids of the dingo and various types of domestic dog. Most of the worst sheep-killers are crosses between dingoes and sheep- or cattle-dogs. There are no recent reliable figures showing the destruction of stock by dingoes and other dogs, but it is recorded in New South Wales official reports that during the 10 years from 1884 to 1893 (inclusive) 566,238 sheep were destroyed by 'tame' dogs, and 802,369 by wild dogs (dingoes and crosses). In Queensland the latest annual figures available (1925) show a loss of 221,000 sheep attributable to the dingo. These dogs, therefore, form a grave menace to the pastoral industry.

The *Fox* has spread over a large part of Australia—having, broadly speaking, followed the rabbit, but, not being quite so adaptable, it has so far failed to penetrate into the highly arid places, in which the rabbit is able to maintain itself in security if not in comfort. The fox undoubtedly exercises a certain restraint upon the rabbit, but for all that it may be looked upon as one of the worst of the noxious animals. Not only does it destroy great numbers of birds—especially ground-birds—but in every State it accounts annually for many lambs and even full-grown sheep. During the three years ending with 1915, some 207,000 sheep (including lambs) were recorded as having been destroyed by foxes in New South Wales alone. In cattle-raising parts but little attention is paid to their existence.

The extent to which the destruction wrought by the fox has retarded poultry-farming is very great. At the time when he first made his appearance on the upland plains of Monaro in New South Wales, turkey-raising was being conducted on a large scale and very economically—the birds simply roaming the open country. The fox quickly altered that. Everywhere in the poultry-raising industry the precautions continually taken against him have added greatly to the cost of production.

The earliest Australian record of foxes comes from Victoria. Between 1870 and 1880 (according to the *Ballarat Star*) Dr. King imported a pair for breeding. There were many other introductions at various times. In Western Australia, where they are not numerous, the first fox was recorded in 1915. Tasmania alone of the States has prohibited its introduction. No complete record of the destruction of foxes is available for the Commonwealth, and though 48,077 are recorded as having been destroyed in New South Wales during the five years 1920-4, this is undoubtedly but a small percentage of those killed in that State. A price is set upon the fox's scalp, ranging in various places from as low as 2s. 6d. up to £1. The fox shows a variation in fur and physique similar to that which is displayed by the rabbit. In the uplands it is larger and has a much heavier coat than in the drier and warmer lowlands.

The *Domestic Cat*.—For many years the common cat has been living in a wild or semi-wild state in many parts of Australia. While to some extent subsisting upon rabbits, it is primarily a destroyer of bird life, and much destruction of native birds (especially of tree-living insectivorous species) is due to it. In its wild state the domestic cat becomes a fine animal with a strong, glossy, heavy fur; some are exceedingly large. The skins are in good demand in the fur-market, and this to some extent reduces the pest; many thousands of the skins pass annually through Australian dealers' hands. Not infrequently cats are to be found living in the rabbit-warrens.

Flying Foxes.—At least two species of fruit-eating bat—familiarly known as flying foxes (see BATS)—are a very serious menace to fruitgrowers. Both the larger species (*Pteropus poliocephalus*) and the smaller (*Syconycteris australis*) do great damage to the soft crops—such as peaches, apricots, plums, nectarines, pears, figs, etc. Not only do they actually con-

sume the fruit, but a vast amount of ripe fruit is damaged and knocked off by them. Other fruits, e.g. apples and quinces, also suffer. At times these bats move over the land in immense flocks, wreaking great havoc. In the day-time they repair, if possible, to some dense thicket or scrub, where large umbrageous trees are to be found, and there they hang in thousands. On several occasions settlers have shot many thousands at one rookery.

The *Native Cat* (q.v.) and the *Tiger Cat* were at one time extremely numerous, and destroyed much poultry. But the last 20 years have seen a great diminution in their numbers, and in many districts they have ceased to exist. Even when at their worst as poultry-destroyers these dasyures exercised a very considerable restraint upon the spread of the rabbit in the eastern and central districts of New South Wales.

The *Wombat* (q.v.) makes its home chiefly in wooded and mountainous country. In certain parts the farmer regards this marsupial as a pest because of its habit of tearing through, or uprooting, the wire-netting fences, and so allowing the entry of rabbits.

The *Bandicoot* (q.v.) is frequently looked upon as a noxious animal because of its tendency to burrow in gardens in order to get at the roots of certain plants, including tubers of various sorts. Yet even at their worst these little animals have nowhere done a fraction of the damage wrought by even a few rabbits, and, where rabbit-proof netting is well maintained, the damage caused by bandicoots is infinitesimal. The burrows made by either the long-nosed or short-nosed varieties are only slight excavations. The bilbee, or rabbit bandicoot, is a nocturnal animal, and so not often seen. Though it has completely disappeared from a large part of its original habitat it is still to be found in western Queensland.

Kangaroos and *Wallabies* (q.v.).—Opinion varies greatly among pastoralists as to the amount of damage done by these marsupials. When pasturage and water are scarce, and starving kangaroos are crowding in, they undoubtedly become a pest to the sheep-owner; but under normal circumstances they can hardly be considered noxious. Wallabies, however, are regarded as a pest in Queensland, particularly in the coastal areas, where farmers in many places are compelled to protect the crops with wire-netting fences. Netting for this purpose is supplied by government on long terms of repayment.

The *Wild Pig*.—In parts of Queensland and New South Wales the domesticated pig, gone wild, causes some destruction to crops and to rabbit-proof wire-netting fences. These pigs are mostly to be found in the vicinity of marshes and lakes, and in country intersected by billabongs and other river backwaters. D.G.S.

Noxious Birds. Of all imported birds the Starling (*Sturnus vulgaris*) is the most noxious. Indigenous in Europe and Asia, probably not a native of the British Isles, where it has been noted as a fruit-pest—especially in the cherry orchards of Kent—it has spread throughout a great part of Australia. A voracious feeder and prolific breeder, the starling takes toll of fruit-growers, farmers, and market-gardeners, its food consisting chiefly of cultivated fruits and cereals. It is sometimes advanced in the starling's favour that it rids sheep of ticks and destroys large numbers of insects; but birds taken from among flocks of sheep have been closely examined, and no sign of ticks has been found in their stomachs. On the other hand the stomach-contents of starlings investigated over a period of 12 months show 70 per cent of vegetable and 30 per cent of animal matter, and of the vegetable matter cereals often amounted to 20 per cent. Undoubtedly starlings help other birds to keep down grasshoppers; but this benefit is altogether outbalanced by their continual depredations.

Starlings, moreover, being strong and aggressive, attack the useful insectivorous birds native to Australia, and drive others—including swallows—from their nesting-places, passing on the parasitic vermin with which starlings themselves are notoriously infected; in the native birds these parasites produce skin diseases which cause all their feathers to drop off. The starling is also a great distributor of noxious seeds, notably of the African box-thorn, besides being a nuisance to people whose houses it selects for its nests and proceeds to fill with vermin.

The date of the first introduction of the starling into Australia is uncertain. In 1863 the ship *Princess Royal* landed in Melbourne starlings, sparrows, and three hives of Ligurian bees, and in that year starlings were sold in Australia in the open market. During the first few years after their introduction they kept closely to the seaboard, roosting in the mangroves. In recent years they have been traced as far north as Lake Callabonna in South Australia, to Ooldea on the trans-Australian (east-west) railway, and to Rockhampton in central Queensland. A few years ago a pair started to nest in the Albany district of Western Australia, but were fortunately destroyed before hatching their brood.

Second only to the starling among imported pests is the House Sparrow (*Passer domesticus*), which was introduced into New South Wales in the early days. The *South Australian Advertiser* of 22 July 1863 mentions a sale of birds brought out in the ship *Orient*, at which an English cock-sparrow—the sole survivor of 100 that had been shipped—was sold for 11s., while two blackbirds brought 68s. In 1865 another consignment was brought by the same ship and handed over to the botanic gardens. Sparrows are responsible for damage to cereals, fruit, and other produce to the value of hundreds of thousands of pounds annually throughout the eastern States, but have not yet become established in Western Australia. They are, however, extending along the east-west railway as far as Ooldea on the edge of the Nullarbor plain, and as far as Eucla on the coast. Their method of advance has been closely observed. One or two will appear at a dwelling for a few days only, and then disappear; very shortly, from six to a dozen will put in an appearance, and at once establish themselves, subsequently sending scouts farther out. Oodnadatta (the dead-end of the Northern railway of South Australia) they have reached in vans that conveyed corn, having been seen to fly from the vans when opened. They have also been traced along the line of cattle-stations from the railway to Lake Frome.

Sparrows destroy a great deal of insect-life, especially when feeding their nestlings (that is, several times a year), but this benefit is greatly outweighed by the damage done to cereals and fruit-crops. Their depredations, however, rarely occur far from human habitations. In farming

areas the investigation of their stomach-contents shows that for several months every year 70 per cent of a sparrow's food consists of cereals. In towns they give additional trouble by choking gutters, spouting, etc., with the grass or straw of which they build their nests. The sparrow is a gregarious bird and forms large flocks during the winter, when it can most effectively be dealt with.

The English Blackbird (*Turdus merula*) has of late years become established in certain districts of Victoria, Tasmania, and South Australia, but little is known of it in the other States. Fortunately its habit of keeping to the thicker undergrowth in damp gullies or well-timbered slopes of the ranges has so far restricted its advance over open country. Its partiality for berries and soft fruits, and its habit of scratching over damp soil, make it an enemy of the gardener, whose seed-beds it destroys. In Europe snails form an important part of its diet, but in Australia it despises them; moreover, it will not touch even berries and seeds until it has devoured all the soft fruits within reach.

The Goldfinch (*Carduelis carduelis*) plays havoc among berry fruits—raspberry, strawberry, etc. It undoubtedly destroys the seeds of many noxious weeds—mostly thistles—but it also takes large toll of other plants, so that the market-gardener incurs great expense in protecting his seed. The goldfinch is increasing rapidly, and has been traced far from the more populous districts. It congregates in large flocks in January; in August or September the flocks break up, and distribute themselves over the country to begin nesting. They like fruit-trees for this purpose, and use the flowers of apples and pears for building-material. They also pull to pieces many varieties of flowers in order to get at the soft seed at the base of the petals. They have been seen to attack the native robins and flycatchers, and drive them away from nesting-sites which they had used for years.

The English Greenfinch (*Chloris chloris*) is one of the latest of foolish introductions. A larger and stronger bird than the sparrow, with a stronger bill, it is increasing rapidly, and must, unless checked, become a source of loss to farmers and fruit-growers. It has already begun to attack standing grain-crops and seeding plants; it is also eating soft vegetables (such as lettuce, cauliflower, and cabbage) in the seedling stage. It does good, no doubt, by destroying Scotch and other thistle seeds.

Since so far no preventive legislation has been enacted by State or Commonwealth governments, foreign birds are allowed to enter Australia almost without control. Until such legislation is effected, other bird-pests may at any time be introduced.

S.A.W.

The Red-whiskered Bulbul (*Otocompsa emeria*) appears to have been introduced at Sydney about 1905; possibly a pair escaped from an aviary or were given their freedom by thoughtless owners. Rather larger than a house sparrow, the bulbul is brownish above, gray and white below, and blackish about the head; more distinguishing features are a sharp, black crest and a patch of crimson beneath the tail. It has a cheerful voice, and does some destruction among insects. On the other hand, evidence collected on behalf of the Australian Museum at Sydney shows definitely that the bird has a strong liking for soft fruits, particularly figs, grapes, apricots, peaches, and mulberries; in a single orchard bulbuls have been known to strip 30 bunches of grapes, and eat large holes in about 100 apricots, 100 nectarines, and 200 peaches. Probably it is the only bird that attacks tomatoes; it is fond also of the berries of the camphor laurel and pepper trees, tips of green pea-plants, and petals of various flowers. An examination of the stomach-contents of several birds failed to disclose insects, the food having been fruits, greens, or berries. As the bulbul is at present confined to Sydney and suburbs, a studied offensive would probably stamp it out. It has been officially declared a pest.

The Indian Dove (*Streptopelia chinensis*), common in Melbourne, Sydney, and Brisbane, and now pushing out into the country districts, is an unmitigated nuisance as a seed-eater and as a usurper of the rights of native birds.

A.H.C.

Noxious Insects. See BEETLES, BITING-LICE, BLOOD-SUCKING FLIES, BOT-FLIES, CATTLE-TICK, CICADAS, COCCIDAE, CRICKETS, EARWIGS, FLEAS, FLIES, GRASSHOPPERS, HEMIPTERA, HYMENOPTERA, MOSQUITOES, MOTHS, SHEEP-TICK, STICK-INSECTS, THRIPS, THYSANURA, WHITE ANTS, WOOD-BORERS.

Noxious Plants. The majority of plant-pests are of alien origin, and few of these are pests in their original habitat: they have become noxious in Australia because (*a*) the new conditions altered their habits and encouraged an abnormal growth, (*b*) their introduction was not counterbalanced by that of their natural enemies. Of these causes the second is the more important. The prickly pear (q.v.), the lantana, the sweetbrier, which in their native environment are comparatively innocuous, are in Australia a menace to agriculture partly because its soil and climate suit them, but mainly because they are not infested with the fungi or mites or larvae that elsewhere checked their undue extension, nor eaten down by the animals that frequented their country of origin, nor destroyed at an early stage as they would be in more densely populated areas.

The most dangerous pest, the prickly pear, is dealt with in a separate article. In the coastal districts scarcely less noxious is the Water Hyacinth (*Eichhornia crassipes* or *speciosa*), an aquatic plant introduced from South America and sometimes cultivated in parks and gardens for the sake of its beautiful racemes of mauve flowers. About the year 1900 a fragment was innocently liberated in Swan Creek, a tributary of the Clarence River in New South Wales, and in two years the hyacinth was in possession of the full 50 yards' width of the creek. Flower-lovers carried it thence to their own homes, and soon the rivers of northern New South Wales (and later on those of Queensland) were infested by the pest. In January 1911 the hyacinth caused a suspension of the traffic at Grafton, and several punt-wires were broken on other parts of the river. Every flood brought down acres of the plant. Many thousands of pounds have been spent to clear navigable channels, but it is difficult to eradicate the weed in sluggish water. Cattle readily eat it, and are often—especially in times of drought—drowned through slipping into deep water and becoming entangled in the root-growth. The foliage is killed by frosts in winter, and the plant will not grow in salt water.

Lantana camara, a member of the verbena

family, introduced as an ornamental shrub from tropical America, has overrun large areas of eastern Australia, chiefly through the agency of birds. It smothers the native plants and renders their habitat difficult of access, but is easily destroyed, and is said actually to improve the soil in which it has grown—e.g. along the Queensland rivers. Sweetbrier (*Rosa rubiginosa*), said to have been first introduced from Scotland, has ruined large areas of grazing-land throughout the cooler districts of all the States. It is spread both by seed and by sucker. Blackberry (*Rubus fruticosus*) has become a pest among the highlands and gullies of the southern half of the continent. In the Illawarra district of New South Wales, throughout Gippsland and other parts of Victoria, on Mount Lofty in South Australia, and in the mountain regions of Tasmania, the blackberry dominates and kills off the indigenous flora; but in some of these districts there is a slight compensation in the tons of fruit picked for jam.

Most of the following thistles were introduced with fodder from Europe:—the Star Thistle (*Centaurea calcitrapa*); Cockspur (*C. melitensis*); Black or Spear Thistle (*Carduus lanceolatus*); Canadian Thistle (*C. arvensis*), very prevalent in Tasmania—its creeping roots are difficult to eradicate; Saffron Thistle (*Carthamus lanatus*); Scotch Thistle (*Onopordon acanthium*); Blue Thistle or Viper's Bugloss (*Echium vulgare*), best known as 'Paterson's Curse,'—Maiden calls this *E. plantagineum*; Russian Thistle (*Salsola kali-tragus*); Prickly or Mexican Poppy (*Argemone mexicana*).

Burrs are particularly obnoxious to pastoralists, as they depreciate the value of wool. On the other hand, wool and sheep are responsible for the wide distribution of weeds. Thus in 1913 there were exhibited before the Linnean Society of London 46 Australian plants found growing in England near wool-washing establishments, together with a large collection of Australian seeds obtained from Australian wool. Far the worst of the imported burrs is the Bathurst Burr (*Xanthium spinosum*), said to have been brought in the tails of horses from Valparaiso about 1840. It is a native of Chile, but derives its Australian name from the fact that Bathurst was the first district in which it was noticed. It is now widely spread over all the States. Its taller-growing ally, the Noogoora Burr (*X. strumarium*), a native of Europe, known in the United States as the clot or cockle burr, is found chiefly in Queensland and northern New South Wales, where whole paddocks are rendered useless by it. The Buffalo Burr (*Solanum rostratum*) from North America is thoroughly naturalized. The Apple of Sodom (*S. sodomeum*), a native of Africa, is noxious as being not only prickly but highly poisonous; the fruits contain an alkaloid, and have been known to be fatal to children. Hedgehog or burr-grasses are everywhere troublesome to stock; *Cenchrus australis* has a sticky seed which mats the hairs of animals and has been recorded as catching insects. Other well-known imported burrs are the Chinese Burr (*Triumfetta rhomboidea*), the Sheep's Burnets (*Acaena ovina* and *A. sanguisorbae*), and the Medic Burrs (*Medicago denticulata* and *M. truncatula*); the last-named, while injurious to wool, are excellent fodder. The Bindi-eye or Bogan Flea (*Calotis cuneifolia*), a native of Australia, is both injurious to wool and a source of irritation to man and beast.

The following weeds have specially noxious characters. Nut-grass (*Cyperus rotundus*)—a cosmopolitan pest, wild in North America—is perhaps the worst garden-weed in Australia. It was probably introduced with pot-plants, and is well known in city parks and botanic gardens. Careful sifting of the soil of infested beds seems to be the sole remedy, except that of allowing pigs a free run. St. John's Wort (*Hypericum perforatum*) is dealt with under its own name. The Cape Weed (*Cryptostemma calendulaceum*), now almost ubiquitous in Australia, is quoted by Maiden as forming 'hair balls' in the intestines of cows when the seed is licked, as do the spinules of the prickly pear and the awns of the Wild Oat (*Avena fatua*). Cape weed should not be confused with Cape Tulip (*Homeria collina*), a much more poisonous African weed which is causing grave concern in Victoria; in New South Wales it has been located in one shire only.

The Castor-oil Plant (*Ricinus communis*), probably a native of Africa, is found on wastelands in coastal regions; its poisonous seed is a standing menace to children as well as to stock. Another proclaimed weed, *Jatropha gossypifolia*, is often called 'castor-oil plant' in Queensland. The Thorn Apple (*Datura stramonium*) is often confused with the castor-oil plant, and bears a seed which has also been recorded as poisoning stock. The Wild Tobacco (*Nicotiana glauca*), from the Argentine, has been found curiously fatal to ostriches, and more rarely to cattle; this plant must not be confused with *Humea elegans*, an indigenous scented 'feather plant' which is a skin irritant, also (but erroneously) called 'wild tobacco.' The Stinkwort (*Inula graveolens*) of southern Europe first appeared as a pasture-pest in South Australia about 1850. It is now proclaimed a pest in all the States, as is the Purple Top (*Verbena bonariensis*) from South America. Other unwelcome Americans are the Red Ink Plant (*Phytolacca octandra*), especially troublesome in tropical and subtropical areas, and Stinking Roger (*Tagetes glandulifera*), which promptly takes possession of cultivated land in Queensland and New South Wales, grows eight feet high, and 'can be smelt half a mile off.' The cosmopolitan Sorrel and Dock (*Rumex acetosella* and *R. crispus*) are especially contumacious in the cooler districts of southern Australia and Tasmania.

Australia has very few poisonous plants, but the death of stock from no obvious cause is often attributed by stockowners and their employees to poison in the fodder. Investigations into this matter are still (1926) in progress, but the following provisional conclusions may be stated here:—

(1) Certain plants contain a glucoside which, when acted upon by a ferment in the plant, liberates hydrocyanic (prussic) acid; these plants are highly poisonous, some throughout the year, some at certain seasons or stages of growth. Among them are Blue Couch-grass (*Cynodon incompletus*), Variegated Thistle (*Carduus marianus*), Johnson Grass (*Sorghum* or *Andropogon halepense*), and various species of oleander (*Nerium*). For Johnson grass see GRASSES and SORGHUM AND MILLET.

(2) A few plants contain saponin (another form of glucoside) and even more virulent poisons; among these are certain Leguminosae (*Gastrolobium, Oxylobium, Isotropis*), especially their Western Australian species, and at least two Solanaceae—*Duboisia Hopwoodi*, the pituri of the aborigines (see DUBOISIA), and *Anthocercis littorea*, which is said to have poisoned children in Western Australia.

(3) The Milk-weed (*Euphorbia Drummondi*) and the Stagger-weed (*Stachys arvensis*) are reputedly poisonous; but enquiry shows that only tired and hungry animals which eat them im-

moderately are affected, the cause of death being indigestion followed by flatulency.

(4) Certain Leguminosae—e.g. *Swainsona*, of which genus the Darling pea (q.v.) is a species—derange the nervous system of stock, the symptoms being analogous to those usually associated with lathyrism and loco disease. Animals may develop an inordinate appetite for the plant, and become inveterate 'pea-eaters;' this renders them useless for the short remainder of their lives.

Legislation, etc.—The underlying principles of the various Australian acts dealing with noxious weeds are (*a*) that the Commonwealth should prevent their introduction from other countries, (*b*) that the States should control the spread of known weeds within their own borders and educate agriculturists in recognizing and destroying them, (*c*) that local authorities should have power, subject to a State veto, to proclaim particular plants 'noxious' within their own areas and should be the direct authority controlling eradication. The defect in this system is that crown lands—which cannot be controlled by the local authorities—are often the breeding-grounds of noxious plants, and become prolific centres of infection in agricultural districts. The Commonwealth's share of the work is effected by the administration of the quarantine acts, 1908-15, under which over 100 genera may not be imported. Each State has its own rules, which unfortunately are not always concordant in neighbouring States; thus blindweed, nut-grass, and several thistles are proclaimed in Victoria, but grow unchecked in New South Wales. Moreover within a single State many plants may be reckoned 'noxious' in one area and harmless just beyond an imaginary boundary-line. Thus, whereas 200 municipalities and shires have proclaimed the Bathurst burr, and over 100 the blackberry, only 11 have proclaimed the Scotch thistle. This variance is, of course, due partly (but only partly) to the fact that the weeds occur only in certain areas and are not proclaimed where they do not occur.

The native weeds are at present few in number, species, and individuals, but they tend to increase as the edible species in their area are eaten out; thus additions are constantly made both to the list of noxious plants and to the areas in which proclamations run.

See J. H. Maiden's *Weeds of New South Wales*; A. J. Ewart's *Weeds, Poison Plants and Naturalized Aliens of Victoria*; J. M. Black's *Naturalized Flora of South Australia*; and F. M. Bailey's *Weeds and Suspected Poisonous Plants of Queensland*.

Numb-fishes. See ELECTRIC RAYS.

Nut-grass. See NOXIOUS PLANTS.

Nuthatch. See TREE-RUNNERS.

Nuts, a name applied promiscuously to many shrubs and trees whose fruit is known vernacularly as a nut. The marsh nut is a *Semecarpus*; the nicker nut a *Caesalpinia*; the union nut one of the Rutaceae.

Nuytsia, a genus of the family Loranthaceae, whose single species, *N. floribunda*, is endemic in Western Australia, occurring in the coastal region from Albany to the Murchison. It attains a height of 35 feet and a diameter of 2 feet; flowers with 6 narrow petals—the supporting bracts enlarge after the flowers fall; leaves narrow, 1½-3 inches long; fruit a dry nut,

Nuytsia (*Loranthus*) *floribunda.*

with 3 short thick wings. It is root-parasitic on certain banksias, and consequently difficult to transplant. The seeds germinate freely, but do not as a rule reach maturity. The wood is soft and spongy, and the tree is but too readily the victim of advancing settlement. It is popularly known as 'mistletoe-tree' or 'Christmas-bush,' and sometimes as 'Swan River blaze-tree;' its masses of brilliant orange-coloured flowers (which, as with the flame-tree—*Brachychiton*—of eastern Australia, occur in great profusion while the tree is still bare of leaves) appear about December and make it one of the most gorgeous flowering trees in the world. See CHRISTMAS BUSH.

Nuyt's Land. See AUSTRALIA, DISCOVERY OF.

O

Oak, a name applied usually to species of the family Casuarinaceae (q.v.), the grain of the timber resembling that of the English oak. But the silky oak (q.v.) is a *Grevillea* and the red silky oak a *Stenocarpus*.

Oakes, Rebecca (1788-1883), born at Sydney on 22 September 1788, was the first white girl (and the second white child) born in Australia. She was the daughter of John Small, who is usually described as a 'private in the New South Wales Corps whom Phillip made sergeant of his bodyguard;' but as Phillip is not known to have had a special bodyguard, and the Corps did not reach Sydney till June 1790, 21 months after Rebecca was born, this description is obviously inaccurate. In 1807 Rebecca married Francis Oakes, who had been a lay member of the London Missionary Society's party that sailed for Tahiti in 1796, were forced to abandon the mission in 1798, and settled in New South Wales, where they were welcomed by Hunter and described by Marsden as 'resolved to settle, and to accelerate the improvement of the Colonial manners by public instruction and domestic example, by manual industry, and by their labours in the service of virtue.' Oakes obtained a grant of 100 acres near Dundas in April 1799; in 1805 King made him head constable 'at Parramatta and for the interior,' and in 1806 described him as 'a most useful officer.' In Bligh's time he came into undesired prominence, first as a witness against D'Arcy Wentworth at a court martial, then as the constable who was ordered to arrest John Macarthur (q.v.); Johnston therefore removed him from office, and Bligh in 1810 took him to England as a witness in Johnston's trial. Macquarie had on 10 January 1810 reinstated him at Parramatta, and after long delays in England he returned to New South Wales and resumed duty. The Oakes family was prolific—twelve children, ten of whom themselves had large families. Rebecca Oakes died at Parramatta on 30 January 1883.—One son, Francis, was in 1860-1 a member of the legislative council. Another, George, represented Parramatta in the earlier council in 1848-56, and in the legislative assembly in 1856-60, and sat for East Sydney in 1872-4; in 1879-81 he was a member of the nominee legislative council. He died on 10 August 1881, the first victim of the Sydney steam trams.

Oats are grown more extensively in Victoria than in all the other states put together, although they succeed equally well in special districts in those states. Notwithstanding the extensive area put under oats annually, Thomas Cherry, a former Victorian director of agriculture, considered that the oat crop 'should be made to fill a much more important sphere in farming operations in all parts of the closer settlement country than it does at present. Owing to the way in which the different varieties are adapted to our climatic conditions, the oat alone may be used to supply the farm with green and dry fodders reaching maturity in each of the months from July to January in succession . . . The main crop in all parts of Victoria is the Algerian Oat . . . The rotation to which the practice of most wheat-farmers is approximating is wheat, oats, grazing, fallow; this is not very far from an ideal rotation, having regard to the present position of agriculture in Victoria.'

In New South Wales oats have been grown from the earliest days. The varieties first grown were the Spanish and a very coarse kind; both succeeded in the metropolitan district, where several thousand acres are still grown annually for hay and green feed; but oats are cultivated most extensively on the tablelands and western slopes—in the western plains little is grown, and in the Riverina divisions they grow chiefly for hay. Since 1910 the cultivation of oats has increased considerably in South Australia and Western Australia. In Tasmania the area under crop has been constant.

The three species of oats grown in Australia are: the common or tree-type (*Avena sativa*), the Algerian type (*A. sterilis*), and the Tartarian type (*A. orientalis*). Typical varieties of the tree-type are Sunrise (a good general-purpose, rust-resisting oat), Abundance, Potato, Lachlan, Guyra, and Ruakura (imported from New Zealand). The Algerian variety is perhaps the most widely grown oat, and belongs to the *A. sterilis* group, other kinds being Mortgage Lifter (almost identical with Algerian), Calcutta, and Red Rust-proof; of the Tartarian (or side-oat) group, White Tartarian is the best.

Oats are valuable not only for grain and hay (or green feed), but as a rotation crop with wheat to assist in the control of 'take-all' and smut. Where the wheat-crop is affected with these diseases, the following is a good rotation: —wheat (affected), fallow, oats (for hay or grain), fallow or fodder-crop (rape or oats), wheat (clean).

The area under oats and the yield for the season 1924-5 were as follows:—

State.	Area under crop. Acres.	Yield. Bushels.	Value. £
New South Wales .	123,517	2,511,400	345,317
Victoria	517,229	9,572,003	1,316,150
Queensland	4,010	63,912	25,565
South Australia ..	155,214	1,939,415	210,097
Western Australia	318,982	4,241,074	596,401
Tasmania	46,175	1,065,933	167,591
Commonwealth .	1,165,127	19,393,737	2,661,121

The production has not yet reached a stage that will admit of regular exports; on the contrary, in each of the four years preceding 1916-17 the imports exceeded the exports, the total excess being some 6½ million bushels, valued at over

one million sterling—chiefly from New Zealand, Chile, Japan, and the United States.

Oats are subject to two diseases only to any appreciable extent, viz. Loose Smut (*Ustilago avenae*) and the rusts (*Puccinia* spp.), though mildew, a foot-rot condition, and even 'take-all' (very rarely) have been recorded on it. The smut is controlled by spraying the seed with 1 per cent formalin solution and covering with bags for four hours; the rust can only be prevented by the use of varieties that show immunity to the disease. W.S.C.

Observatories. See ASTRONOMY.

Ocean Currents. See CURRENTS, OCEANIC.

Ocimum, a widespread genus of the family Labiatae, of which the only species indigenous to Australia, *O. sanctum* (a branching under-shrub with small purple or white flowers), is chiefly Asiatic, and derives its specific name from being frequently planted about Hindu temples. It is strongly scented, and is used medicinally by the Cingalese.

O'Connell, SIR MAURICE CHARLES (1812-1879), son of Sir M. C. P. O'Connell (q.v.), was born at the old military barracks in Sydney in January 1812, sent to England to be educated in 1819, and appointed to his father's old regiment —the 73rd—in 1828 (ensign, 1828; lieutenant, 1834; captain, 1838). In 1835 he obtained leave to volunteer for service under the Spanish crown, raised a regiment (the 10th Munster Light Infantry) to fight in the Peninsula, saw a good deal of fighting in the Carlist war, became general of the British auxiliary legion, was decorated with several Spanish orders of knighthood, and on the disbandment of the legion in December 1837 returned to England still a lieutenant. On 22 June 1838 he was commissioned captain in the 28th regiment, which was going to New South Wales, and accompanied his father there as military secretary; but when the regiment returned O'Connell sold out and remained in the colony, breeding horses and entering politics. From 1845 to 1848 he represented Port Phillip in the legislative council; then he became commissioner for crown lands in the Burnett district, and in 1854 was made government resident at Gladstone (see GLADSTONE COLONY), which the New South Wales authorities were fostering in the vain hope that it would become the chief town of the prospective colony of Queensland. For five years he administered the Port Curtis district with zeal and ability; but his desire to make Gladstone the shipping centre of central Queensland was frustrated by the foundation of Rockhampton on the Fitzroy River, a little farther north—for the Fitzroy gave direct access to large areas of the interior, from which Gladstone was cut off by much rough and difficult country.

When in 1859 Queensland was made a separate colony, O'Connell became a nominee member of the legislative council, attaining its presidency in 1861 and holding that office until his death. He took an active interest in public education, agriculture and racing, four times administered the government of the colony between governorships, and enjoyed great popularity in all his capacities. Dying in Brisbane on 23 March 1879, he was accorded a public funeral; and when it was known that he had maintained his public positions by the expenditure of all his private means, his widow was voted a pension by the legislature. (Kt. Bach., 1868.)

O'Connell, SIR MAURICE CHARLES PHILIP (1768-1848), born at Riverston in county Kerry, Ireland, and brought up mainly in France at the charges of his kinsman Count Daniel O'Connell, joined the Irish brigade of the French army in 1790, but in 1792 had a captaincy in the anti-revolutionary forces under the Duke of Brunswick, and two years later rejoined the Irish brigade as reconstructed in the British army. For the next 12 years he served with various regiments in the West Indies, gaining much credit and two swords of honour; on 15 October 1806 he was made a major in the 73rd foot, promoted to command it (as lieutenant-colonel) on 4 May 1809, and sent with its first battalion to New South Wales. Accompanying Macquarie—under whom he held a commission as lieutenant-governor—he reached Sydney at the end of 1809. At first Macquarie and he worked cordially together; but before he had been six months in the colony O'Connell married the daughter of ex-governor Bligh, and from her seems to have acquired her natural dislike of all those who had shared in the revolt against her father. By 1813, therefore, Macquarie (who had not been prepossessed with Bligh, and was anxious to have harmony restored in his little kingdom) told Bathurst that, if the O'Connells were removed, 'the remains of this Party Spirit and Faction will be Completely annihilated;' and by 1815—when O'Connell had left the colony, but was supposed to be eager for the lieutenant-governorship of Tasmania—Macquarie's memory of him was concerned only with his 'illiberal national partialities and prejudices . . . . irritable temper and overbearing disposition.'

In 1814 the 73rd was relieved, and O'Connell proceeded with it to Ceylon, retiring on half-pay when it returned to England. In 1830 he was promoted major-general, and in 1838 revisited New South Wales as commander of the forces stationed there. He became lieutenant-general in 1841, was made colonel of the 80th foot (then in Sydney) in 1844, administered the government in 1846 between the departure of Gipps and the arrival of FitzRoy, and handed over his command to Major-general Wynyard in December 1847. On the day he was to have left for England—25 May 1848—he died at his house on Potts Point, Sydney. (Kt. Bach. and K.G.H., 1834.)

O'Connor, CHARLES YELVERTON (1843-1902), born at Gravemouth in Ireland in 1843, educated at the Waterford endowed school, and afterwards apprenticed to engineering, migrated to New Zealand in 1865, and from then until 1883 was assistant-engineer and engineer for various districts in the South Island. In 1883 he became under-secretary for public works, and in 1890 was appointed marine engineer for New Zealand. In April 1891 he accepted the combined appointment of engineer-in-chief and manager of railways for Western Australia. In 1896, at his own request, O'Connor was relieved of the railways, but retained the position of engineer-in-chief until his death on 9 March 1902. His period of office in Western Australia was marked by the inception and completion of two great engineering works, the Coolgardie water-scheme and the Fremantle harbour-works. (C.M.G., 1897.) J.S.B.

O'Connor, RICHARD EDWARD (1851-1912), son of a clerk of parliaments in New South Wales, was born at Sydney on 4 August 1851, educated at the Sydney grammar school and university (B.A., 1871; M.A., 1873), and in 1871

entered the public service as a clerk in the legislative council—spending his spare time in writing for the press and reading for the bar, to which he was called in 1876. In 1888 he was nominated by Sir Henry Parkes to the legislative council. While opposing Parkes on tariff questions (for O'Connor was a convinced if moderate protectionist), he supported the old statesman in the cause of federation; and, when Dibbs in October 1891 defeated Parkes and formed a new ministry, it was only to support Edmund Barton—on whom Parkes had thrown his mantle—that he took the position of minister for justice. At the end of 1893 the two champions of federation were attacked for taking part—Barton as arbitrator and O'Connor as counsel—in an action between the colony's railway commissioners and a contractor; both resigned their ministerial positions, and the prospects of federation seemed at their gloomiest. But when in 1897 George Reid's scheme for discussing federation through a body of elected representatives from the several colonies came into effect, O'Connor found himself one of the ten from New South Wales; he was also one of the three members of the committee that drafted the constitution, and took an active part in open convention when the provisions for deadlocks were being modelled; but his most difficult and least conspicuous work was the attempt to carry through the New South Wales legislative council the various bills and resolutions needed to ensure the passage of the convention's recommendations. In the end it was found necessary to appoint 12 new members to the council.

With the advent of federation O'Connor's zeal and industry found a new sphere. Barton, with whom he had always heartily co-operated, made him vice-president of the executive council in the first Commonwealth ministry—an office which carried with it, as soon as O'Connor was elected by New South Wales to the senate, the leadership of that body. Here his bitter experience in the New South Wales council stood him in good stead, for he had to carry a protectionist tariff and the naval agreement of 1902 through a house markedly freetrade in its views and extremely suspicious (for reasons explained in the article on NAVAL DEFENCE) of the agreement. In both tasks he succeeded. But it cost him his health, and his withdrawal from politics in September 1903, to become one of the first three judges of the federal high court, was no less a necessary condition of longer life than a reward for past public service. In 1905 he was appointed first president of the Commonwealth court of conciliation and arbitration—another tribute to his tactfulness—but resigned it thankfully in 1908, and devoted his powers thenceforward mainly to the solution of the numerous constitutional difficulties which have occupied so much of the high court's time. From the excessive strain of his past political career, however, he could not wholly recover; he died of anaemia, while still in active work as a judge, on 18 November 1912.

O'Connor's value to Australia during the stormy years before and after the attainment of federation cannot be too highly estimated. Through them all he retained the admiration and affection of opponents as well as of friends; and an obituary notice in *The Times* pronounced his eulogy in terms with which no one is likely to quarrel:—

> In the cabinet he was sagacious, wise and far-seeing. In the house he was uniformly calm, courteous and courageous. . . . His political career can best be epitomized as embodying in essentials consistency, in non-essentials liberty, in all things charity. . . . On the bench he was above all things a sound constitutional lawyer, and helped to build the Commonwealth by judicial interpretation on a solid and enduring foundation.

Octopus. See MOLLUSCA.

Odonata. See DRAGONFLIES.

Officer, SIR ROBERT (1800-1879), born in Scotland on 3 October 1800 and educated at St. Andrews, migrated to Tasmania in 1821, was appointed medical officer for New Norfolk, and built up a considerable private practice. In 1853 he gave up medical work, and was elected for Buckingham to the legislative council. On the establishment of responsible government he became member for Glenorchy in the new assembly (1856). He was made chairman of committees, and in 1861 speaker, a post which he held till 1877. He took special interest in the acclimatization of salmon and trout, and it was mainly his influence that kept the vote for that purpose regularly in the budget. Retiring from public life in 1877, he died at New Norfolk on 8 July 1879. (Kt.Bach., 1879.)

O'Flaherty, ELIZA (1818-1882), better known by her maiden name of Winstanley, born on 1 September 1818 in Kent-street, Sydney, began her stage career on 31 October 1834, when she appeared as Clari in the *Maid of Milan*. For the next ten years she was the leading actress in Sydney, being successful both in tragic and comic rôles. In 1845 she and her husband, Henry Charles O'Flaherty, a musician whom she married in 1841, left the colony for England, France, Russia, and Germany. In 1848 she appeared at the Astor Place Opera House, New York, where she played Mistress Quickly to James Hackett's Falstaff. On her return to England she joined Charles Kean's company at the Royal Princess's Theatre and continued with him when he toured the provinces. She was especially successful in Shakespearean plays, and was noted also for her singing. Her portrait is included in J. O. Halliwell's edition of Tallis's *Portrait Gallery of Distinguished Actors and Actresses of the Fifties*. About 1865 she gave up the stage for literature and wrote many Australian stories, some of which were published serially in the journal *Bow Bells*, which she edited for some years. Her better-known works include *Desmoro: or The Red Hand*; *Twenty Straws*; *For Her Natural Life* (written before Marcus Clarke's novel); and *Bitter Sweet* (which she published serially in the *Sydney Mail* in 1860). Some of her stories, which number altogether about 33, were published under the pen-name of 'Ariele.' About the end of the seventies she returned to Australia and died at Sydney on 2 December 1882.

Ogilvie, WILLIAM HENRY, born near Kelso, Scotland, on 21 August 1869, was educated at Kelso high school and Fettes College, Edinburgh. Coming to Australia in 1889 he engaged in droving, horse-breaking, and kindred occupations 'out-back' in New South Wales. He returned to Scotland in 1901, went thence to Iowa, U.S.A., edited an agricultural paper there, and in 1908 returned again to Scotland, where he still resides; much of his time is devoted to freelance journalism, and he is now regarded as a genuine 'Scottish bard.' It is however, by his Australian work that Ogilvie will be best remembered; in popularity his *Fair Girls and Gray Horses* proved second only to Pater-

son's *Man from Snowy River*. Ogilvie was, indeed, another Paterson, in that he loved the free life of the wide spaces and sang of its charms in rollicking ballads (e.g. 'From the Gulf') which go with a swing; but he touched the hem of the higher poesy (as in 'Bowmont Water') rather more often than his contemporary and used a wider sweep by reason of his Scottish associations and the fact that Australia was to him a big new adventure; he could also sing of babyhood (as in the widely known verses 'A King Deposed'). During the great war he published in London *Punch* a verse-tribute to the 'Anzac' as 'the bravest thing God ever made.'

He has published in verse: *Fair Girls and Gray Horses* (Sydney, 1899); *Hearts of Gold* (Sydney, 1901); *Rainbows and Witches* (London, 1907); *Whaup o' The Rede* (Dalbeattie, 1908); *The Land we Love* (Dalbeattie, 1910); *The Australian* (Sydney, 1916); *Galloping Shoes* (London, 1922); *Scattered Scarlet* (London, 1923); *Over the Grass* (London, 1925); and in prose: *My Life in the Open* (London, 1908); *The Honour of the Station* (London, 1914).

O'Halloran, THOMAS SHULDHAM (1797-1870), son of Major-general Sir Joseph O'Halloran, was born at Berhampore in India on 25 October 1797, and in 1808 entered as a cadet at the Royal Military College—then at Marlow in Buckinghamshire, but removed to Sandhurst in 1812. He joined the army in 1813 (ensign, 1813; lieutenant, 1817; captain, 1827), and saw service in the Nepal, Deccan, and Burmese wars between 1814 and 1825. Retiring in 1838, he sailed with his family for South Australia and reached Adelaide on 21 November; in February 1840 he was appointed major commanding the local militia, and in June of the same year became commissioner of police, and undertook several expeditions against thieving or murderous aborigines. He resigned the commissionership in 1843, and was nominated to the legislative council as a non-official member. When in 1851 the first instalment of representative government was granted, he contested two elections unsuccessfully; but when the constitution of 1857 came into force he was returned at the head of the poll for the new council, and held the seat until his retirement from politics in June 1863. In 1854 he was gazetted lieutenant-colonel of the local volunteer force. He died at his home near Adelaide on 16 August 1870.—His younger brother WILLIAM LITTLEJOHN O'HALLORAN (1806-1885), also born at Berhampore on 5 May 1806, joined the army in 1824 (ensign, 1824; lieutenant, 1826; captain, 1837), saw active service at the siege of Bhurtpore (1825-6), served in India (1824-29), Ireland (1832-4), and India again (1835-6), visited Sydney with a detachment of his regiment (the 50th) in 1834, and retired from the army in 1840. On 11 August of that year he reached South Australia, where he was private secretary to Governor Grey (1843-5) and auditor-general of the colony (1851-68). He died at Adelaide on 15 July 1885.—William's son, JOSEPH SYLVESTER O'HALLORAN (1842-1921), born at Adelaide on 28 March 1842, after a long career in the public service of the colony which ended in 1871, spent ten years in secretarial work in London and in travel, and in 1881 was appointed assistant-secretary to the Royal Colonial Institute; in 1884 he was made secretary, and held the position until 1909. He died on 29 January 1921. (C.M.G.,1895.)

Oil. This article deals with mineral oils, of which no liquid deposits have yet been found in Australia; modern prospecting methods have, however, been employed only since 1917. In 1920 the Commonwealth government offered £50,000 for the discovery of commercial oil-pools in the Commonwealth; in 1925 this offer was withdrawn, and was replaced by a proposal to subsidize on the £-for-£ basis *bona fide* companies operating in areas approved by the government's advisers. Meanwhile, under an agreement with the Anglo-Persian Oil Company made in 1920, the company supplies, at current rates, the Commonwealth oil refinery at Laverton in Victoria (in which the government holds a bare majority of shares) up to 200,000 tons of crude oil a year from its Persian fields. Outside this agreement Australia imports oil to the value of about £7,600,000 annually from the Dutch East Indies, California, Pennsylvania, and the mid-continental fields of the United States.

The geological history of Australia suggests that the conditions of sedimentation and earth-movement controlling the formation, migration, and accumulation of petroleum into commercially valuable oil-pools of Tertiary age—as found in the world's principal oil-belts, connected with the Tethys, Malaysian, Antillean, Pacific, Alpine, Caucasian, and similar mountain zones—did not extend to Australia. Any Australian oil-fields of commercial value would belong to Mesozoic or Palaeozoic formations, and it is in the Walloons (Jurassic) of Queensland and the Kimberley (Permo-Carboniferous) beds of Western Australia that geologists have seen possibilities of oil-discoveries. Up to the present time, however, prospecting indicates that the great Meso-Palaeozoic region of Australia is comparable to peninsular India, South Africa and Brazil, none of which have yet been proved to contain oil deposits.

Positive indications that oil exists in Australia, commercially or otherwise, are:—(*a*) Asphaltum of great purity is periodically washed up on the southern shores of the continent. This inspissated petroleum must be derived either from the coastal rocks or from their faulted extension (the 'continental shelf'); it has been thought to warrant prospecting in the Tertiary measures of southern Australia, if structurally favourable areas can be discovered. So far only one definite 'dome' structure has been located—at Comawn in Victoria, where a private company is boring. (*b*) Bitumen fragments, highly metamorphosed and approaching coal in their characteristics, have been discovered filling vesicles in basalt and in the associated limestone joints in Cambrian rocks of the Ord-Negri district of north-western Australia, as well as in the Cambrian shales of Elcho Island in the Northern Territory. (*c*) Natural gas of the 'wet' type has been met with in large quantities in artesian bores sunk in the Roma district of Queensland, and at Grafton in New South Wales. 'Dry' natural gas was also struck at Lake Bunga in eastern Victoria, in a bore sunk to test the Tertiary deposits of the district for oil. (*d*) Oil of a light nature was struck at 70 feet in a water-bore at Beaudesert in Queensland, and heavy waxy oil at great depths in artesian bores sunk in the Longreach and Blackall districts of the same State.

On the other hand, many hundreds of prospecting bores for coal, oil-shale, water, and minerals have been sunk throughout Australia, without encountering anything more than traces of oil—or sometimes copious quantities of gas.

So far as the more accessible southern and eastern parts of the continent are concerned, the consensus of opinion is that, if oil does occur there, it does so under conditions differing entirely from those in other parts of the world. The great north-western areas of thick Palaeozoic sediments, often highly fossiliferous, which dip gently off the Archaean shield 'nucleus' and thus suggest a resemblance to the Palaeozoic formations in the oil-belts of the eastern and mid-continental fields of North America, are only in the initial stages of prospecting.

In *New South Wales* bores for oil have been sunk at Penrith, Coonamble, and Grafton—with negative results, except for gas at Grafton; the rocks penetrated were mostly horizontal or gently dipping Mesozoics, although spasmodic bore-sinking for oil has been undertaken in rocks of Permian, Devonian, and Silurian ages.

The folding movements which closed the Permian period in Australia affected a narrow strip in the eastern part of the continent extending from the Hunter River in New South Wales to northern Queensland. Recommendations for boring on the Hunter River areas—notably on the Belford 'dome' structure—have been made by Dr. A. Wade, and companies are being subsidized by the Commonwealth government to undertake the work. The favourable opinion of the Hunter River region as oil-producing is based chiefly on the existence there of a 'dome' structure, but the problem is complicated by faulting and lack of knowledge of the nature of the marine fauna from which the oil might have originated.

In *Queensland* natural gas was accidentally struck at 3683 feet in an artesian bore at Roma in 1900, and unsuccessful efforts to light the town from this supply were made four years later. Thenceforth until 1916 efforts to tap and utilize the gas were made, with more or less disastrous results. In 1916 the state government began to prospect for oil, but met with a series of misfortunes in drilling; it was, however, demonstrated that the gas discharged was of the 'wet' or petroliferous type.

In 1922 a private company commenced operations with a modern plant at Orallo, near Roma, where Dr. H. I. Jensen had reported favourably upon the prospects for commercial oil. The results hitherto have been disappointing, partly because of drilling accidents, largely because of water troubles in the bore. Dr. Wade has reported unfavourably on the Beaudesert, Tewantin, and Wolston areas, but has recommended further prospecting in the rocks of the Queensland artesian basin and its intake-beds.

South Australia.—Prospecting has been done on the coast and inland, not only in moderately deep Tertiary rocks, but also in the closely-folded schists of Archaean age, where the occurrence of oil is impossible. Bores have been put down at Kingston, Robe, Tantanoola, Mount Gambier, the Coorong, and the Glenelg River, in all cases with negative results; the deepest bore (at Robe) penetrated over 3000 feet into the Jurassic strata before being abandoned.

Victoria.—Prospecting in the gently domed or warped strata of Tertiary age at Torquay in Gippsland, and in the brown coal-measures of that region, have yielded negative results; the beds, however, are crowded with marine fossils of all kinds, including the 'oil'-type foraminifer *Orbitoides lepidocyclina.* Natural gas of the 'dry' type was struck at 900 feet in a bore at Lake Bunga, and flowed intermittently.

Tasmania.—No definitely favourable indications have been met with in this State, though large sums have been spent in boring the highly faulted and tilted Permo-Carboniferous rocks of the Mersey valley. Rocks of the Tertiary fringe have not yet been prospected for oil.

Western Australia.—Several moderately deep bores have been sunk in the Kimberley division, chiefly because of the presence of bitumen in the Ord-Negri area and of small oil 'seeps' in a bore at Price's Creek. The sites were selected in gently folded Cambrian and Carboniferous rocks, but oil in commercial quantities has not yet been discovered.

Briefly summarized, the search for oil in Australia has yielded only small traces of petroleum products, and quantities of natural gas, in places which otherwise present the 'requisite and essential conditions for the occurrence of oil.' This clearly indicates that earth-movements and underground-water conditions which have affected the continental rocks from Palaeozoic times (at the close of which general 'folding' movements ceased in Australia) have not caused accumulation of the oil-contents of the rocks into suitable reservoirs, whereas erosional agents have helped to dissipate any oil deposits that might have been formed previously.

Papua and the Mandated Territory.—New Guinea is an integral part of the so-called Malaysian 'arc' zone—which embraces the oil-producing islands of the Netherlands Indies, and which has been subjected to the same folding movements in late Tertiary times; the prospect of locating commercial oil-pools in the Tertiary rocks of Papua and the Mandated Territory is therefore hopeful, though exploratory drilling results so far have produced only about 2000 gallons of crude petroleum. Oil and gas seepages are numerous, especially in the coastal portions of Papua, where most of the boring operations have been conducted.

The oil-measures of Papua occur in a late Tertiary series of fossiliferous mudstones, sandstones, limestones, and marls, associated here and there with lignite and carbonaceous sediments. The upper measures are Pliocene to recent, the lower Plio-Miocene; their total thickness is from 3000 to 7500 feet. In the Mandated Territory similar measures occur, of an estimated total thickness up to 15,000 feet, but distributed over a much smaller area.

Prospecting was initiated in the Vailala River district of Southern Papua by the Commonwealth government in 1912, and continued under great difficulties until 1919. In the interim eight shallow bores and one moderately deep one (1800 feet) had yielded 2000 gallons. Running muds and high gas-pressures gave great trouble in the drilling, but the quality of the oil was very high.

The Anglo-Persian Oil Company, acting as agent for the British and Commonwealth governments, who jointly financed the operations, took over control in 1920. Its experts considered that the wells sunk on the Vailala area were located in ground too highly faulted to justify hopes of commercial oil-yields; after much geological surveying of the Gulf-coast region from Yule Island to the Vailala River, a site for boring on an undisturbed anticline at Popo near the Kapuri River was selected, and drilling commenced in 1922. Difficulties in dealing with soft flowing mudstones led to the abandonment of this bore at 1825 feet, and of a second one at 894 feet; a third bore met with heavy caving strata at 2375 feet, and the boring tools were buried. The estimated depth of the oil

horizons in the Popo district is from 2000 to 3500 feet in Plio-Miocene beds.

In 1923 private oil-prospecting companies were allowed access to Papua—except in an area of 1160 square miles including the Popo district—and a number of licences have been issued. Prospecting work and geological surveying are proceeding on some of the licensed areas, but up to June 1926 no results of importance were obtained.

In the Mandated Territory oil seepages have been reported from time to time, and geological surveys have been made by the staff of the Anglo-Persian Oil Company, the government geologist, and privately. Shallow bores have been sunk at Matapau, near Aitape, and at Marienberg on the Sepik River, and small quantities of oil of good quality reported. Farther inland, notably in the Sepik and Ramu valleys, geological conditions are more favourable. Oil-search licences are issued to private companies; licensees have the exclusive right to prospect an area up to 1000 square miles in extent for a term of five years (renewable); should petroleum be struck, they may take up oil-leases of four square miles each for 21 years (renewable), paying a royalty to the crown of 2½ to 5 per cent on all oil won.

Oil-shale. *New South Wales.*—Large deposits of high-grade kerosene-shales (torbanites) are found in the Permo-Carboniferous measures of New South Wales, notably in the Wolgan valley near Capertee, in Hartley Vale below Mount Victoria, at Murrurundi in the Hunter valley, and at Joadja near Mittagong. Similar shales occur in the coal-measures of the Mersey River district of Tasmania, and in the Tertiary and Carboniferous rocks of Queensland. The origin of the torbanites has been proved to be due to the local accumulation in basins of showers of minute spores (sporangia), algae, and seeds, with an admixture of peaty material from the swampy ground in which the associated coals were formed. Many rhizomes of *Glossopteris* in the growing position, Entomostraca shells, and other fossils have been isolated from the deposits.

The richer varieties of kerosene-shale resist weathering, and closely resemble the true cannel coals. They may be regarded as the middle members of a series including true oil-shales and cannel coals as the extremes; the less coaly torbanites grade downward into oil-shales proper, and the more coaly upward into the cannel coals. Original conditions of deposition, and the subsequent metamorphism of the sediments containing the shaly raw material, determined whether the final product would be true oil-shale, torbanite, or cannel coal. The earth-movements necessary to the actual distillation and storage of oil did not subsequently occur, so that the deposits are still in the solid oil-shale stage, and invariably occur in lenticular form over limited areas (rarely exceeding one to two square miles in extent) and of a thickness of up to 5-6 feet of workable shale. Physically the torbanites resemble closely the typical Cretaceous and Tertiary shales of Colorado in the United States, but they contain more volatile matter, and consequently yield more oil and gas.

As mined, the New South Wales torbanites contain from 40 to 77 per cent of volatile hydrocarbons; the best types range from 57 per cent upwards. Ash, sulphur, nitrogen, and oxygen are usually low, so that the resultant distilled oil is very pure and closely resembles a typical crude paraffin-petroleum. As much as 150 gallons of oil per ton has been obtained, but a fair average yield from commercial plants which have been in operation in the past may be taken as from about 80 to 100 gallons.

The discovery of oil-shale in New South Wales dates back to 1802; its occurrence in Hartley Vale was noted in 1845, and mining began in 1865, the shale being chiefly exported for gas enrichment. By the close of the 19th century crude oil-retorting works were established on the fields, mostly on a small scale and in a primitive manner. In the first decade of the present century large retorting plants and refineries were established at Joadja, Newnes (in the Wolgan valley), and Murrurundi; these were financed in most cases by English capital and were based on the Scottish system of retorting, which was afterwards proved unsuitable to Australian conditions. The Joadja mine was closed down in 1905, but was reopened in 1925. The Newnes works of the Commonwealth Oil Corporation of London, the largest and most ambitious shale-retorting company in Australia, closed down in 1914, and the British-Australian Oil Company's mine at Murrurundi closed a year later. The old plant of the Commonwealth Oil Corporation was taken over by a Sydney company, modified Pumpherston retorts were erected, and the plant operated until 1922. The total production of crude oil during that period was approximately 12,800,000 gallons, on which a bonus amounting to 3d. per gallon was paid by the government. The quantity of shale mined in New South Wales is 1,919,043 tons—of which less than 10 per cent was actually retorted, for a total production of 13,000,000 gallons of oil.

It is now certain that both retorts and methods of use must be adapted to the specific shale treated, with due regard to local conditions. Scottish retorts of the Pumpherston type, even when modified, are unsuited for dealing with New South Wales torbanites—which, unlike the Scotch shales, are rich in 'kerogen' and low in nitrogen. Bronder and Crozier retorts are being used on local shales in both New South Wales and Tasmania.

Queensland.—Work on a commercial scale has not been undertaken in this state, but workable shales of medium quality have been discovered in the Tertiary measures of Curtis Island near Rockhampton. Torbanites are found at Baffle Creek and Duaringa in the Leichhardt district; types similar to those of New South Wales also occur on the Queensland slopes of the Macpherson Range.

Tasmania.—Tasmanite, a torbanitic shale of somewhat inferior quality occurs—in tens of millions of tons and in thicker workable seams than those of New South Wales—over a large area on both sides of the Mersey River in the lower Permo-Carboniferous coal-measures. Attempts to work these deposits in the past have been unsuccessful, but two small companies produced oil at the rate of about 40 gallons per ton of shale retorted; the oil was refined in Melbourne. A large private company is erecting huge works in the Mersey valley to treat up to 1000 tons of tasmanite per day by the Bronder process; the oil-yield is only about half of that from New South Wales torbanites, and injurious sulphur compounds are invariably present in the tasmanite oil, yet it is considered that lower mining costs and easier methods of treatment will more than compensate for this difference.

J.L.S.

Olacinaceae, a family of trees, shrubs, and climbing plants widely dispersed over tropical and subtropical regions. The flowers are usually small. Nine genera are indigenous to Australia. The genus *Olax,* which extends over tropical Asia and Africa, contains five Australian species —four are eastern, but *O. Benthamiana* reaches Western Australia. *O. stricta,* an erect, slender shrub, has the leaves arranged in opposite pairs, and branches ranked in a few rows, giving the plant a flattened outline. The creamy flowers are much frequented by bees, and the green fleshy fruits are greedily devoured by poultry. The genus *Pennantia* has one representative in Norfolk Island and one in New Zealand; *P. Cunninghami* is endemic in Australia; it is a tall shrub, with large ornamental leaves and black-berried fruits. Remarkable structures known as domatia (q.v.) are found on the leaves of this species.

Old Age Pensions. See PENSIONS.

Old Wife, a small fish (*Enoplosus armatus*) very common in inlets on the coasts of the southern half of Australia, and well known by its striking colour-marking, which consists of broad dark-brown bands on a white ground, and fins banded with brown and pink. It was one of the first fishes made known from Australia, being illustrated in Surgeon White's *Voyage to New South Wales,* published in 1790. It is a tasty little table-fish, but is rarely utilized; it seldom exceeds eight or nine inches in length, and, unless taken with the trammel net, does not often appear in the markets. A.R.McC.

Oleaceae, a small family of trees, shrubs, climbers, or herbs found in warm to temperate regions. Five genera with 24 species are indigenous to Australia. The flowers are usually in clusters; fruit a succulent drupe or dry capsule. The genus *Jasminum* has seven indigenous species, with white or yellow flowers; some are highly ornamental sweet-scented shrubs. *Olea paniculata* (Native Olive) the only indigenous species of its genus, extends to New Caledonia. It is a moderate-sized tree, with a succulent drupe resembling that of the common olive. The wood when newly cut has a rose-like fragrance. The heart-wood is nicely mottled, tough, durable, and suitable for turnery. See CHIONANTHUS, NOTELAEA.

Olearia, a genus of the family Compositae, consisting of herbs and shrubs (rarely small trees) with white or blue flowers. They are often called 'native asters,' and are closely allied to the old-world genus *Aster.* The floral bracts are imbricate, in several rows; marginal florets rayed; fruits usually cylindrical, with the pappus bristles in a single row. *O. argophylla* (Musk Tree), grows in Tasmania to a height of 20-30 feet with a trunk-girth of 3 feet; in Victoria and on the south coast of New South Wales it attains almost the same size. The silvery leaves are musk-scented. The timber has a pleasant fragrance; its gnarled root-stock is mottled, and is well adapted for cabinet-making. *O. myrsinoides,* a very variable species, is also musk-scented; *O. ramulosa,* a heath-like shrub, is covered in the season with a profusion of small white flowers; in *O. dentata* the flowers range from white to pink and blue, occasionally on the same plant.

Olive, a name applied (*a*) to the cultivated

1868. After ten years' practice in England he

GROWING, (*b*) to certain Australian trees and shrubs of the same family, for which see OLEACEAE and NOTELAEA.

Olivine. See MINERALOGY.

O'Loghlen, SIR BRYAN (1828-1905), third son of a distinguished Irish judge who was created a baronet at the coronation of Queen Victoria, was born on 27 June 1828, educated at Oscott and at Trinity College, Dublin (B.A., 1856), and after making trial of engineering, farming, and commerce was called to the Irish bar in 1856. Migrating to Melbourne (which he reached in January 1862), he was called to the Victorian bar and practised his profession assiduously for the next 15 years. In May 1877 he plunged into politics as an advanced liberal and a supporter of Graham Berry, and after one defeat was elected for West Melbourne in February 1878 and made attorney-general in the Berry ministry in March; meanwhile, however, he had (on 22 July 1877) succeeded his elder brother in the baronetcy and been elected to the British parliament as member for county Clare. On his acceptance of office under Berry the Irish seat was declared vacant.

O'Loghlen took office in the midst of the turmoil that followed 'Black Wednesday' (q.v.), which is fully described under BERRY, SIR GRAHAM; it would seem that even before his appointment he had advised the governor that the ministry's action was strictly in order. He supported Berry through thick and thin, and was given the post of acting-premier while the Berry-Pearson delegation visited England. The 1880 elections left him without a seat; the Berry ministry resigned immediately after them; when it was re-formed (after a second set of elections, in which O'Loghlen gained the West Bourke seat), he found himself left out. Consequently in July 1881, as soon as the dispute between council and assembly had been temporarily settled, he displaced Berry from the premiership and himself formed a ministry that lasted until March 1883, never possessing a genuine majority, but maintained in office by the conservatives in order to exclude Berry. An extravagant policy of railway construction and the imposition of a poll-tax on immigrant Chinese were the two principal achievements of this ministry, which was heavily defeated at the elections of 1883 and was succeeded by the famous Service-Berry coalition. O'Loghlen himself lost his seat and, though he soon afterwards became member for Belfast and in 1890 helped James Munro to turn out the Gillies-Deakin coalition, returned to office in 1893-4 only as attorney-general under J. B. Patterson. When this ministry was expelled in September 1894, O'Loghlen retired from active political life—though in 1897 he appeared as vice-president of an 'Anti-Commonwealth-Bill League,' having been a steady opponent of federation. He died in Victoria on 31 October 1905.

Onion, Wild. See BULBINE.

Onion-wood. See DYSOXYLON and OWENIA.

Onslow, SIR ALEXANDER CAMPBELL (1842-1908), was born on 17 July 1842 at Ripley in Surrey. His mother was a daughter of Alexander Macleay (q.v.). Educated at Westminster School and Trinity College, Cambridge (B.A., 1864), he was called to the bar on 17 November 1868. After ten years' practice in England he

was in 1878 appointed attorney-general of British Honduras. In 1880 he was transferred to a similar position in Western Australia, where in 1883 he became chief justice. In this capacity he administered the government of the colony during the temporary absence of Sir F. Napier Broome, and was later 'interdicted' by that governor for premature publication of official correspondence. The local executive council confirmed this suspension and placed the judge on half-pay; but Lord Knutsford, then colonial secretary, reinstated him with a rebuke. A later quarrel with the legislative council (which asked for his removal 'in the interests of tranquillity') led to his temporary supersession by Sir Henry Wrenfordsley (q.v.); but he resumed his position in 1891 and held it for another ten years. Retiring in 1901, he died in England on 20 October 1908. (Kt.Bach., 1895.)

Onslow, Arthur Alexander Walton (1833-1882), son of A. P. Onslow of the East India Company's service, was born at Trichinopoly in India on 2 August 1833, brought to Sydney in 1838 to stay with his grandfather Alexander Macleay, taken to England in 1841 by the widow of Colonel Dumaresq, and entered on board H.M.S. *Howe* as a midshipman in May 1847 (lieutenant, 1852; commander, 1863; post-captain, 1871). He served in the Channel and Mediterranean squadrons and off the west coast of Africa (1850-1); during the Crimean war he was employed in the Baltic, being present at the bombardment of Sveaborg, and in March 1857 sailed for Australia, where for the next four years he was engaged in a survey of Shark Bay, Torres Straits, and the external reefs of the Great Barrier. Returning to England in 1861, he served in the Gulf of Mexico and the Mediterranean, but was compelled by bad health to leave the service and reside in Sydney, where in 1867 he married James Macarthur's eldest daughter and founded the family of Macarthur-Onslow. In 1874 he accompanied William Macleay in an exploration along the New Guinea coast. Entering local politics in 1869, he represented Camden in the assembly until 1880, when he was appointed to the legislative council. He died on 31 January 1882.

Opal, a mineral consisting almost entirely of hydrated silica, which occurs in two main forms. *Common opal* is usually colourless or milky, but is sometimes banded, or coloured red, green, or pink by absorption of organic matter. The opal from certain deposits, however, displays by reflected light brilliant flashes of colour which are due to structural peculiarities in the stone; this is known as *precious opal,* and it alone is discussed here.

Of Australian opals there are four recognized varieties—boulder opal, sandstone opal, seam opal, and black opal. Boulder opal was first discovered in Queensland about 1875, and was introduced to the London market about 1879, but with little success. It occurs in veins ramifying through ironstone boulders, and in layers so thin that the cut stone (which is very brilliant in colour) must be left with a flat face and a backing of matrix. Similar opal was discovered in 1877 at Rocky Ridge Creek on the Abercrombie River in New South Wales, where it occurs in vesicular basalt; but specimens suitable for jewellery are rarely obtained there, and the deposits have not been worked commercially. West of Cunnamulla in Queensland boulder opal is found in minute boulders known as 'Yowah nuts,' which sometimes contain the usual thin veins and sometimes loose kernel-like gems. Sandstone opal, which was discovered in Western Queensland about 1886, usually occurs as pipes of varying diameter from an inch downwards; the sandstone through which they run overlies in patches the great Rolling Downs formation of western Queensland (see Geology). Sandstone opal is as a rule thick enough to be cut cabochon shape; the introduction of these stones to the London market (which took place in 1889) was successful, and from that time Australian opal has been reckoned among valuable gems. The sandstone opal area is a belt of western Queensland about 250 miles wide, extending about 550 miles north-west from Hungerford on the New South Wales border to Kynuna at the head of the Diamantina River.

In 1889 a kangaroo-hunter picked up at White Cliffs in western New South Wales a brilliant piece of opal lying on the surface. The neighbourhood was at once prospected, and large deposits of a new kind of opal—seam opal—were uncovered, besides opalized shells, fossil bones, and bunches of crystal that the miners called 'pineapples.' This opal is free of matrix, and occurs either as flat cakes up to 7 oz. in weight or as lumps, some of which have weighed 50 oz. White Cliffs opal soon became popular in Europe and the United States; although the milky Hungarian opal was traditionally the finest procurable, the superior brilliancy of the Australian product appealed to wearers of jewels, and in 12 years the White Cliffs output attained a value of over 1½ millions sterling. In 1903, when the supply was beginning to dwindle, two prospectors along the upper Darling struck opal at Lightning Ridge near Walgett. This type was distinguished by the black body-ground in which the colours gleamed, a normal opal's body-ground being colourless or milky; for some years the new variety was difficult to market, specimens fetching only £1 or £2 per ounce, at a time when the White Cliffs product was selling at prices up to £50 per ounce. By 1910, however, Lightning Ridge was yielding two-thirds of the Australian output, and in 1914 80 per cent of it, White Cliffs having been practically abandoned. In 1915 a new field was discovered in the Stuart Range west of Lake Eyre in South Australia. This produces chiefly a light opal identical with the White Cliffs stone, but occasional specimens (in no way related to the true black opal) show an inky colouring matter. The trade depression of recent years has limited the opal market, and the lack of permanent water at the Stuart Range (Coberpedy) field has simultaneously restricted its output; no production was recorded there in 1922 or 1923, and in New South Wales only £3040 worth was won (all but £40 worth from Lightning Ridge), and in Queensland £500 worth, but these figures cannot be absolutely relied upon as parcels of stone are often disposed of privately and not recorded. Small quantities are found in the Beechworth district of Victoria.

See T. C. Wollaston's *Opal* (1924) and Pittman's *Mineral Resources of New South Wales* (1901).

Opossums. This name, borrowed from the North American Indians and applied to the American marsupial family Didelphyidae, has been almost universally adopted in Australia for certain members of another and widely different family (Phalangeridae). This is a family of diprotodont marsupials almost exclusively arboreal in habits and vegetarian in diet, both

pairs of limbs being adapted for grasping and climbing among the branches of trees. The family includes the koala (native bear), opossums or phalangers (in the narrower sense to be here considered), cuscuses, flying opossums or Australian flying squirrels, dormouse opossum, pigmy flying opossum, and long-snouted honey-mouse.

Of phalangers proper by far the commonest and best-known is the Common Australian Opossum (*Trichosurus vulpecula*), which occurs all over Australia except on the Cape York Peninsula. Of the size of a large cat, it has close, soft, woolly fur of a brownish-gray colour above; whitish or yellowish below; blackish round the eyes, on the sides of the snout, and on the chin; and black at the terminal part of the tail—which sometimes has a white tip. The outer sides of the limbs are like the upper surface, the inner like the lower; the hands and feet are white,

Common Gray Opossum
(*Trichosurus vulpecula*).

gray, or brown. The ears are rather long, erect and pointed, hairy behind; the eyes wide apart; the snout short and sharp; the upper lip deeply cleft. The fore- and hind-limbs are nearly equal in development. The fore-limb has five nearly-equal digits, all with strong claws. The hind-limb has the first toe opposable, thumb-like, to the other toes, the second and third bound together (syndactylous), the fourth and fifth nearly equal. The tail is long and prehensile, naked of hair on the lower surface for the last three to six inches of its length, and naked all round at the extreme tip. The pouch of the female is shallow.

The common opossum is an expert climber, and makes constant use of its prehensile tail in maintaining itself securely among the branches. When followed and pressed by a climbing enemy, it relaxes the hold of hands and feet and drops so as to be suspended by the tail only. Like the majority of marsupials it is nocturnal, and during daylight sleeps in the interior of a hollow tree or similar cavity; in country where trees are too small it may live in burrows. Its food consists mainly of the leaves of certain eucalypts; but leaves of other trees, fruits, and an occasional small bird or reptile may be added. The female brings forth once a year two young, which remain for a long time in the pouch, and are afterwards carried about on the back of the mother. Two sub-species have been described from the mainland, *Trichosurus vulpecula arnhemensis* from the Northern Territory, and *T. v. eburacensis* from northern Queensland. The Tasmanian variety (*T. v. fuliginosus*) is a little larger than the mainland form, and has thicker and darker fur, which is brown. A second species, the Short-eared Opossum (*T. caninus*), occurs in southern Queensland and New South Wales.

Nearly related to the common opossum are the cuscuses (*Phalanger*); but the latter have comparatively harsh fur, short ears, and a tail naked for some distance at the end. The Spotted Cuscus (*P. maculatus*) occurs in the Cape York Peninsula, and is found also in Papua and over the whole Austro-Malayan region. Another species, the Gray Cuscus (*P. orientalis*), is found in Timor, and various other islands east of Papua, including the Bismarck Archipelago, Duke of York Islands, and New Britain. *P. ornatus* inhabits the Gilolo group of islands (Ternate and others), *P. celebensis* occurs in Celebes and Sangir, and *P. ursinus* in Celebes only. A small species *P. breviceps*, is restricted to islands of the Solomon group, and another insular species occurs in the Aru Islands. Three additional species, *carmelitae*, *coccygis*, and *sericeus* have recently been described from New Guinea.

The ring-tailed opossums (*Pseudochirus*) are smaller than the common opossum, and have thinner fur. The two inner toes of the fore-foot are opposable to the other three. The tail is long and tapering, and highly prehensile, being towards the end naked underneath. The Common Ring-tailed Opossum (*P. laniginosus*), found in southern Queensland, New South Wales, Victoria, and South Australia, is of comparatively large size, the head and body being about 16 inches in length, the tail about 14 inches. The general colour of the upper surface is gray or rufous,

Ring-tailed Opossum
(*Pseudochirus laniginosus*).

that of the lower surface white, grayish-white, or rufous. A somewhat similar but darker species (*P. peregrinus*), first collected by Captain Cook's party at the Endeavour River, inhabits north-eastern Queensland. Another species (*P. dahli*) is a peculiar short-tailed, rock-living form, which

is found in the Northern Territory. Other species are the Western Ring-tail (*P. occidentalis*) of Western Australia, the Tasmanian Ring-tail (*P. cooki*), also the recently described *P. cervinus* from the Atherton Tableland in northern Queensland. Archer's Ring-tail (*P. archeri*), the Herbert River Ring-tail (*P. herbertensis*), and the Sombre Ring-tail (*P. lemuroides*) are all from the Herbert River district in Queensland. At least 10 species have been described from New Guinea.

The striped opossums (*Dactylopsila*) are more nearly related to the flying opossums though they have no flying membrane. W.A.H.

The name 'possum,' by which the opossum is commonly known in Australia, has been accepted by naturalists in view of the differences between this Australian marsupial and the true opossums of America. [A parallel acceptance of a corrupted name is to be found in 'goanna' (see LIZARDS), applied to a lizard (*Varanus*) often incorrectly termed 'iguana' because of its passing resemblance to the American reptile of that name.]

For a number of years the fur of the common opossum has been in great demand throughout the world. This has led to vast destruction of the species in the eastern States, especially in Queensland, where the total officially recorded as killed in one year has run into several millions. During the last few years, notwithstanding the incentive of greatly enhanced prices there has been a steady falling off in the killing. Complete figures are not available, but in Queensland the number of skins officially recorded in 1919 was 2,500,000; in 1923 it was 1,200,000. In Victoria during an 'open' season of only two months in 1926 no fewer than 470,000 skins were taken. It is, however, recognized that the official figures in all probability fall far short of the number actually taken, and many skins are known to be sent in with rabbit pelts. Unfortunately the greater part of the destruction takes place in the winter months, when the fur is thicker and of better quality. As this is also the time when the young are being carried in the pouch, it is clear that complete extinction of the opossum will ensue unless large areas are effectively maintained as sanctuaries.

It is often said that the opossum does damage to crops; but such statements are generally found to be baseless; they mostly spring from a desire to get the skins for commercial purposes. Undoubtedly a certain amount of damage is done to fruit-crops in parts where the opossum is plentiful, but such damage is much exaggerated; fruit-growers in the metropolitan district of Sydney successfully grew large crops at a date when the opossum was exceedingly abundant in the vicinity.

Movements for the preservation of the animal have received much support in the eastern States from pastoralists and stock-raisers, not for its own sake, but because of the widespread illicit employment of pellets of cyanide of potassium laid for it, and the consequent destruction of large numbers of horses, cattle, and sheep.

See DORMOUSE OPOSSUM, FLYING OPOSSUMS, KOALA, LONG-SNOUTED HONEY-MOUSE, MARSUPIALS, STRIPED OPOSSUMS, and WYULDA. D.G.S.

Opossum Wood. See QUINTINIA.

O'Quinn, JAMES. See QUINN, JAMES.

Orange Perch, a deep-water fish (*Anthias pulchellus*) taken by trawlers off the coasts of New South Wales and Victoria. Though a good table-fish, it is rare in the markets, and does not grow much above nine inches long. During life its colouring is a rich orange-yellow. A.R.McC.

Oranges. See FRUIT-GROWING.

Orange-thorn. See PITTOSPORACEAE.

Orca. See WHALES.

Orchids, the vernacular name of a family of monocotyledonous herbs comprising about 550 genera and approximately 20,000 valid species, practically cosmopolitan in their distribution—although as a rule they avoid extremely dry or extremely cold conditions. In tropical areas they are usually epiphytal—i.e. they grow on trees and obtain nourishment from the air. Epiphytes have been found as far south as Stewart Island in New Zealand (47° S. lat.), and terrestrial forms (those that grow from roots in the earth) occur in the tropics: but the general rule is that tropical orchids are epiphytal and extra-tropical orchids terrestrial.

In Australia the order is represented by 65 genera and about 450 valid species: but the botanical survey of the continent is still very incomplete, the Northern Territory in particular being almost unknown botanically. Of these species rather less than a third are epiphytes, confined to the tropical and eastern portions of the Commonwealth (including Tasmania); no epiphytes have been found in South Australia or in the extra-tropical area of Western Australia. Terrestrial species are capable of adapting themselves to more variable conditions of soil and climate, and have therefore a much more extensive range. For most an annual rainfall of at least 10 inches appears essential, but a few species of *Caladenia, Thelymitra,* and *Pterostylis* have been found in the arid regions of South Australia, and even in the Great Victoria Desert. A table showing the distribution of Australian orchids is given at the end of this article.

Twenty-three genera are essentially Australian; of the 274 species comprised in them 262 are believed to be endemic. The remaining genera have been derived from tropical Asia, undergoing considerable modification during migration; they are now, with apparently few exceptions, represented by endemic species. Ten species are figured on plate xxxi.

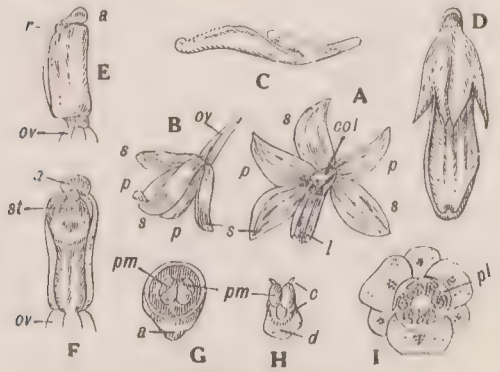
The characteristic features of an orchid may be illustrated by reference to the flower of *Dipodium punctatum*, which consists of an outer whorl or circle of 3 sepals, somewhat similar in shape and size. They are separate from each other as well as from the more central members, and are therefore called free. Alternate with the sepals are three petals, also free: but the lowest petal is modified in shape, and consists of a large middle-lobe and two much smaller side-lobes. It is thus the most conspicuous feature in the flower, and is known as the labellum. The sepals and petals together are called the perianth. In its centre is the column, a prolongation of the floral axis which bears in a consolidated mass the anther and stigma. The anther, lid-like in shape, is placed on the top of the column, and the stigma is situated just below it. Within the anther are two rounded yellow masses (pollinia or pollen-masses), each grooved on its lower surface. In *Dipodium* and in most epiphytes these masses are generally hard and waxy, but in most

Drawn by Rosa C. Fiveash.

1. *Lyperanthus nigricans.*
2. *Pterostylis falcata.*
3. *Thelymitra grandiflora.*
4. *Diuris pedunculata.*
5. *Sarcochilus Fitzgeraldi.*

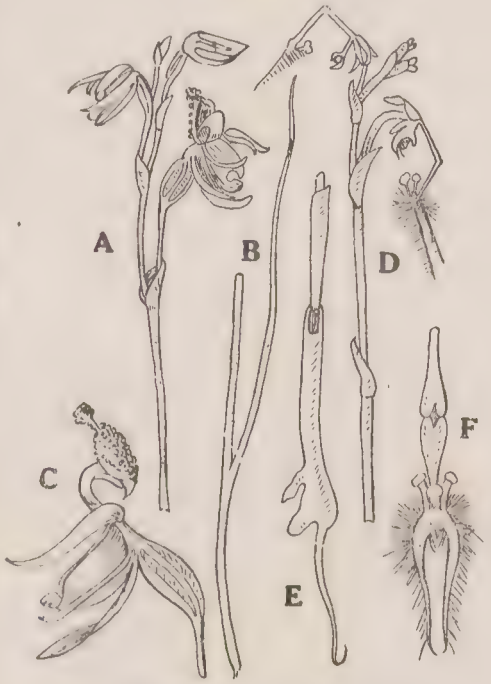
6. *Caladenia Patersoni.*
7. *Diuris elongata.*
8. *Dendrobium superbiens.*
9. *Calochilus campestris.*
10. *Sarcochilus divitiflorus.*

terrestrial forms they are usually soft and mealy. Immediately below the anther, the upper border of the concave stigma is produced into a sterile lobe, the rostellum; this is a small, blunt, glistening projection, which performs important functions in the process of fertilization. The ovary is situated at the base of the flower behind the perianth. It is twisted spirally through an angle of 180°, thus bringing the labellum, which should be normally uppermost, to the lower side of the flower, so as to become a convenient landing stage for insect visitors. In all Australian orchids the ovary contains but a single cell, composed of three large and three small segments; to the former are attached fleshy placentas, which bear clusters of ovules.



Dipodium punctatum.
(A) Flower from front, (s) sepal, (p) petal, (l) labellum, (col) column; (B) side view of flower, (s) sepal, (p) petal, (ov) ovary; (C) labellum from side, showing large middle lobe and one of the shorter lateral lobes; (D) labellum from above, showing its three lobes; (E) column from the side, (a) anther, (r) rostellum; (F) column from front, (a) anther, (st) stigma; (G) anther seen from below, (a) anther-cap, (pm) pollen-masses in situ, each mass is seen to be bilobed; (H) pollinarium, (d) viscid disk, (c) stipes, on to the ends of which the pollen-masses (pm) have fallen from the anther-case; (I) transverse section of the single-celled ovary, (pl) placentae.

The structure of the flower in *Dipodium* is comparatively simple, and represents a plan from which there are many departures; sepals and petals show much variation in shape and colour, and may be free, or adherent to their fellows, or to other segments of the perianth. In *Thelymitra* the third petal is almost exactly similar to the other segments of the perianth. All other genera have a distinct labellum, generally more or less 3-lobed, though the lateral lobes may be small, rudimentary, or obsolete. Its surface may be plain, or furnished with raised lines, excrescences, or calli. Sometimes, as in *Calochilus*, it is densely fringed. Occasionally it assumes fantastic shapes, often resembling living or extinct animals, and frequently insects; such resemblances are noticeable in *Drakaea*, *Spiculoea*, and *Caleana*. Its structure may be further complicated by the presence of spurs, pouches, and appendages of various kinds. These are all probably concerned in the process of pollination, being devices for attracting the attention of insects. The labellum is often strikingly coloured or parti-coloured. In certain Western Australian species of *Caladenia* (*C. lobata* and *C. plicata*) the claw is so flexible and elastic that the slightest breeze gives it a vibratory movement. Movements of a less distinctly vibratory character may also be observed in *Pterostylis barbata* and *P. turfosa*, in both of which the labellum is long, thread-like, and hairy. All such movements tend to attract visitors to the sexual portions of the flower. Occasionally the organ is sensitive and, when stimulated by the touch of a visiting insect, flies up against the column, carrying the insect into the interior of the flower, whence it can only escape by performing some necessary step in the process of pollination. Such imprisonment is effected with surprising rapidity in *Pterostylis*, and some species of *Drakaea*, but more deliberately in *Caleana*.



(A) Inflorescence of *Caleana minor*; (B) stem and leaf; (C) flower. (D) Inflorescence of *Spiculoea Huntiana*; (E) root and stem; (F) labellum.

The column is sometimes extremely short, as in *Diuris*, *Oberonia*, *Zeuxina*; in *Galeola*, *Pterostylis*, and *Caladenia* it is much elongated. The anther is usually inclined forwards in the direction of the stigma. It may be permanently attached to the column, or may (e.g. in epiphytes) fall off as soon as its pollen-contents are liberated. In epiphytes it is lid-like in shape; in terrestrial orchids it exhibits great diversity of form. It is primarily 2-celled, but the cells may be more or less completely subdivided or modified to accommodate the pollinia satisfactorily.

The pollinia vary in number from one to four pairs. In Australian epiphytes, and in some terrestrial genera of exotic origin (such as *Phajus*, *Spathoglottis*, and *Geodorum*), they are waxy in consistence. In the remaining genera, the great majority of which are essentially Australian, the pollen is either mealy or granular. The pollinia sometimes lie free in their cells, quite unconnected with the rostellum, but more usually are connected by their narrow ends with this organ or its representative. Commonly there is a gland on the rostellum to which the pollinia are attached, either directly or by the medium of an elastic strap known as the caudicle. Sometimes there is no gland. The caudicle, when present, is usually single, and is formed by the junction of the elastic strands from the various pollen-

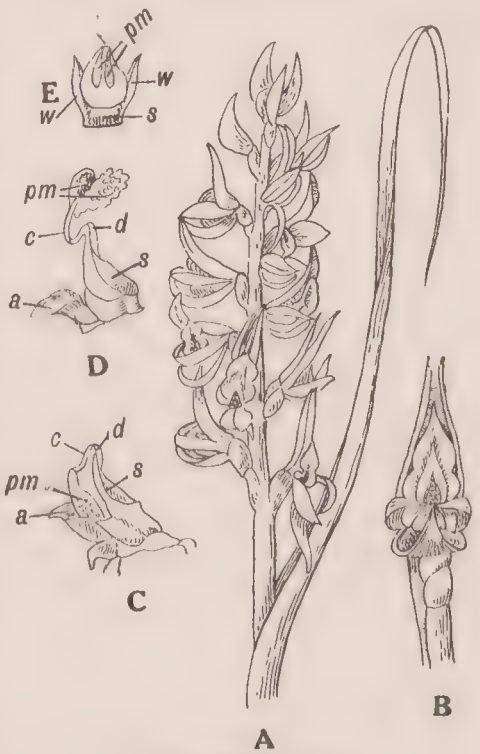
masses. In a few cases, however, it is double; both caudicles may be attached to a common gland, as in *Epipogum*, or each may be inserted into a separate gland, as in *Habenaria*. In *Spathoglottis* there are two caudicles but no gland.

The caudicles mentioned above must be regarded as a product of the pollen-masses, but in the large tribe Vandeae an important modification of the pollinary apparatus takes place. Here there is no true caudicle, this organ being replaced by a single or double linear projection (stipes) derived from the back of the rostellum. This may be seen in *Dipodium*, where a double stipes projects backwards from a glandular disk which has become detached from the rostellum. In the immature flower the pollen-masses occupy their respective cells in the anther, above the stipes, but not in contact with them. If the waxy pollinia are examined at this stage, each will be seen to have a sticky groove on its lower surface. When maturity is reached, each pollen-mass drops accurately on to the stipes below it, and becomes cemented thereto along the line of the groove. The glandular disk, owing to its sticky undersurface, still retains its position lightly on the rostellum, but can easily be removed, together with the stipes and pollinia, by a light touch from an insect visitor. These structures are collectively known as the pollinarium. Within a minute of removal the ends of the stipes, together with the attached pollinia, become depressed, and the latter are then in the exact position necessary for successful pollination of the stigma of the next flower which the insect may visit.

The stigma is situated on the front of the column, almost always just below the anther—though in *Gastrodia* it will be found at the extreme base of the elongated column. In *Pterostylis* it is not sticky, but is usually so in the great majority of Australian orchids. The rostellum, in the mature flower, is apparently always viscid.

In the case of a flower so profoundly modified as the orchid there was much difficulty in tracing the ancestral type from which it has been evolved. We are indebted to the genius of Robert Brown (q.v.) for the elucidation of this intricate problem. As the outcome of a careful investigation into the distribution of certain structures, known as the vascular bundles, together with other considerations, he was led to the conclusion that the flower originally consisted of 3 sepals, 3 petals (one modified to form a labellum), 6 anthers in two whorls, and 3 stigmas, one of which has been specialized to form the rostellum. Of the 6 original anthers, only one (belonging to the outer of the two whorls) is fertile in Australian orchids. In the exotic genus *Cypripedium* this particular stamen is merely a sterile rudiment (staminode); the two fertile stamens belong to the original inner whorl. Many or all of the suppressed stamens may be traced as appendages about the column. In this connection the examination of so-called abnormal flowers—which are often reversions to ancestral type—is particularly instructive; in one such flower, now in the writer's possession, there are five distinct sterile stamens present, in addition to the fertile one, the full complement being thus represented. As a rule, however, stamens which have ceased to be of service in the economy of the plant are completely suppressed, or represented only by mere rudiments, whereas those which may usefully function in another capacity (e.g. the hair-tufts in *Thelymitra*), undergo structural transformation and are retained. With regard to the stigma, evidence of bilobing is present in some Australian orchids, notably in *Pterostylis*, the stigma of which is distinctly bifid. In *Habenaria* there are two separate stigmas, borne on special style-like structures. As pointed out by Brown, the third or sterile stigma is represented by the rostellum.

Three types of mechanism for pollination have been observed in Australian orchids: (1) that suitable for cross-pollination by insects, as in *Dipodium* and *Pterostylis*; (2) that suitable for self-pollination only, as in some species of *Thelymitra*, notably in *T. luteociliata*; and (3) a mechanism suitable for either cross- or self-pollination, so that, in the event of unsuccessful pollination by insects, the plant is able to depend



Prasophyllum gracile.

(A) Inflorescence and leaf; (B) flower enlarged; (C) column, (a) anther recurved, (c) caudicle, (d) disk, (pm) pollen-masses, (s) stigma; (D) column, lettering as in C; (E) column from front, (r) rostellum, (w) wings, (pm) pollinia, (s) stigma.

on its own resources. This occurs in *Prasophyllum gracile*, and probably in many other species of this genus.

In Australian orchids self-pollination is effected much more frequently than was believed probable by Darwin. So far as can be ascertained, no epiphyte is fertilized in this manner, the mode being confined entirely to terrestrial forms. It has been observed in seven or eight species of *Thelymitra*, the best example being *T. luteociliata*. The flowers of this species cannot be said never to open, although they do so very rarely, and then only on excessively hot days; they are, however, fertilized in the bud long before expansion is possible, and long before the full size of the mature flower has been attained. One has, indeed, to search diligently to find a bud young enough to show the condition of the

parts prior to dehiscence of the anther. Other orchids which are known to be self-pollinated are *Spiranthes australis, Orthoceras strictum, Spathoglottis Paulinae,* some species of *Calochilus,* and probably some species of *Diuris.* Other members of the family are still under investigation.

The third method is best studied in *Prasophyllum gracile.* In the immature flower of this species the pollinarium (except the gland) is completely covered by the anther-case. As the flower matures, the anther-point recurves, exposing the caudicle and upper portions of the pollinia to the drying effects of the December air. As a consequence the caudicle begins to curl upwards, dragging the pollinia with it (C). This leaves a triangular space between the caudicle and the back of the rostellum. The pollinarium can now be easily removed by inserting the point of a needle into this space. The back of the gland being sticky, it adheres to the needle, and the pollinia will then be seen to rotate through an arc of 180°. The flowers are much frequented by a small beetle, *Trogoderma adelaidae,* to the head and thorax of which pollinia will sometimes be found adhering. These masses will be observed to present in such a manner that, when the insect visits the base of the labellum in another flower, they are in the correct position to ensure their deposition on the stigma. In a very large number of flowers pollen-masses may be seen adhering to the stigmas, and in many cases the pollinia of the flowers so pollinated are still in situ, showing clearly that the masses on the stigmas have been transported from other flowers. Hence it is certain that cross-pollination does occur in this species in a large percentage of cases. No pollen-carriers were observed other than *Trogoderma.*

Should the pollinarium not be removed, the act of rotation proceeds as follows. It passes through the stage shown in D, and finally the pollinia are deposited, usually with great accuracy, on the middle of the stigmatic surface (E). Occasionally—from accidental circumstances, such as wind, or the irregular curling of the caudicle in the final stage of rotation—there is a tendency for the masses to be deposited elsewhere than on the stigma; but this tendency is usually counteracted by the lateral wings of the column, and pollination is thus successfully accomplished.

However elaborate the mechanism for pollination, a great proportion of Australian orchids depend largely on vegetative reproduction. In certain genera, such as *Caladenia, Microtis, Prasophyllum,* and *Thelymitra,* capsules are produced freely, and the minute seeds are shed in countless millions. Some doubtless survive and germinate, but a vast proportion must perish.

Prasophyllum gracile first came under the writer's observation in 1907, when he received from a correspondent two specimens only. Though carefully looked for, no more specimens were discovered until December 1912, when they were found blooming in vast numbers in a much-frequented part of the mountains that had been swept by an extensive fire in the earlier part of the year. It was assumed that they would reappear in the same locality; but, although a thorough search has been made annually not a trace of them has yet been found. And yet in this orchid infinite precautions have been taken to ensure pollination. It has been observed that during seasons following extensive bush-fires the mountains become carpeted with orchids, many belonging to species that are comparatively rare at other times. It might reasonably be supposed that fierce conflagrations would

TABLE SHOWING DISTRIBUTION OF THE VARIOUS GENERA.

Tribes.	Genera.	Species.						
		N.T.	Q.	N.S.W.	Vic.	Tas.	S.A.	W.A.
Epidendreae...	*Microstylis* ...	...	1	...	...	...	...	...
	Oberonia ...	...	2	2	...	...	...	...
	Liparis ...	...	8	2	...	...	...	...
	Dendrobium ...	3	44	14	2	1	...	1
	Bulbophyllum....	...	16	5	...	...	...	...
	**Adelopetalum* ...	...	...	1	...	...	...	...
	Cirrhopetalum...	...	1	...	...	...	...	...
	Osyricera ...	...	1	...	...	...	...	...
	Eria	...	2	...	...	...	...	...
	Phreatia ...	...	2	...	...	...	...	...
	Pachystoma ...	1	...	...	...	...	...	...
	Spathoglottis ...	...	2	...	...	...	...	...
	Phajus... ...	...	2	1	...	...	...	...
	Pholidota ...	...	1	...	...	...	...	...
	Calanthe ...	...	1	1	...	...	...	...
Vandeae ...	*Eulophia* ...	2	2	...	...	...	...	1
	Cymbidium ...	1	5	3	...	...	...	1
	Geodorum ...	1	2	1	...	...	...	...
	Dipodium ...	1	2	1	1	1	1	...
	Luisia	...	1	...	...	...	...	...
	Phalaenopsis ...	...	1	...	...	...	...	...
	Sarcochilus ...	...	15	8	2	1	...	...
	Vanda ...	1	...	...	...	...	...	...
	Cleisostoma ...	...	7	2	...	...	...	...
	Ornithochilus ...	...	1	1	...	...	...	...
	Taeniophyllum .	...	1	1	...	...	...	...
	Appendicula ...	...	1	...	...	...	...	...
Neottieae ...	*Galeola* ...	...	2	2	...	...	...	...
	Corymbis ...	...	1	...	...	...	...	...
	Spiranthes ...	...	1	1	1	1	1	...
	Anoectochilus ...	...	1	...	...	...	...	...
	Zeuxine ...	...	2	...	...	...	...	...
	Cheirostylis ...	...	...	1	...	...	...	...
	Goodyera ...	...	2	...	...	...	...	...
	Hetaeria ...	...	1	...	...	...	...	...
	Thelymitra ...	...	2	10	16	8	16	18
	**Epiblema* ...	...	...	...	...	...	...	1
	Diuris ...	...	9	17	8	5	8	7
	Orthoceras ...	...	1	1	1	1	1	...
	Cryptostylis ...	...	2	3	2	1	1	1
	Prasophyllum....	...	7	23	22	12	13	17
	**Anticheirostylis*	...	...	1	...	...	...	...
	Microtis ...	...	2	2	3	3	4	9
	Corysanthes ...	...	3	5	4	4	3	1
	Pterostylis ...	1	16	27	28	17	21	10
	Caleana ...	...	2	2	3	2	2	1
	**Spiculaea* ...	...	1	2	2	...	...	1
	**Drakaea* ...	...	...	...	...	...	...	4
	Acianthus ...	...	3	2	2	2	2	1
	Townsonia ...	...	...	...	...	1	...	...
	**Eriochilus* ...	...	1	1	1	1	1	4
	Lyperanthus ...	...	1	3	2	2	1	3
	**Burnettia* ...	...	...	1	1	1	...	...
	Cyrtostylis ...	...	1	1	1	1	1	1
	**Leptoceras* ...	...	...	...	1	...	1	1
	Caladenia ...	...	5	16	21	13	19	38
	**Glossodia* ...	...	2	2	2	1	1	3
	Adenochilus ...	...	...	1	...	...	...	...
	Chiloglottis ...	...	2	5	5	2	...	...
	Calochilus ...	1	2	3	4	1	2	1
	Nervilia ...	1	4	...	...	...	...	...
	Didymoplexis ...	1	...	...	...	...	...	...
	Gastrodia ...	...	2	1	1	1	1	1
	Epipogum ...	...	1	1	...	...	...	...
Ophrydeae ...	*Habenaria* ...	10	8	...	...	...	...	...
Total number of species for each state		24	208	177	136	83	100	126
Total number of genera for each state		12	53	40	25	24	20	23

* Genera peculiar to Australia.

destroy any dormant seeds, but it seems that, on the contrary, the fires create conditions favourable for germination. Possibly germination has in some way been stimulated by the chemical products of the burnt forests, but the more probable explanation is to be found in the presence of a benign fungus. Modern research has shown that many (possibly all) orchids are dependent for germination on the presence of such a fungus, which has been found associated with their roots or tubers. In fact, long before such an association was known or understood, horticulturists had discovered that it was possible to cultivate the seed of certain exotic species by growing it in close proximity to the roots of the parent plant. It is possible that these great forest conflagrations create conditions favourable to the propagation of the fungus most suitable for the abundant production of our terrestrial orchids.

In some genera seed-capsules are produced with comparative infrequency. Few orchids, for example, possess such a highly specialized mechanism for pollination as *Pterostylis*, yet very few capsules are produced by many members of that genus, the mode of reproduction being chiefly by the vegetative method. It is conceivable that a set of conditions may arise unfavourable to such a mode of propagation but favourable to reproduction by seed, so that the mechanism of pollination would be of real practical utility to the plant. In any circumstances a few capsules seem to be produced every season, and these probably contain sufficient seed to ensure the perpetuation of the species, even if the conditions should be so rigid as to result in the failure of the vegetative method.

The genera most largely represented in Australia are *Dendrobium*, *Bulbophyllum*, and *Sarcochilus* among the epiphytes; *Thelymitra*, *Diuris*, *Prasophyllum*, *Microtis*, *Pterostylis*, and *Caladenia* among terrestrial forms. Many species are sufficiently beautiful or interesting to repay cultivation, e.g. *Sarcochilus Fitzgeraldi* and most species of *Dendrobium*. Among ground orchids such showy genera as *Phajus*, *Calanthe*, *Spathoglottis*, and others are well worthy of the horticulturist's attention. R.S.R.

Ord, Sir Harry St. George (1819-1885), son of Captain H. C. Ord of the royal artillery, was born at North Cray in Kent on 17 June 1819, educated at Woolwich, and appointed to the royal engineers in 1837 (2nd lieutenant 1837; lieutenant, 1839; captain, 1846; brevet-major, 1854; lieutenant-colonel, 1859; brevet-colonel, 1864; major-general, 1869). His early service was mainly in the West Indies (1840-5) and West Africa (1849-50). During the Crimean war he was attached to a joint Anglo-French expedition operating in the Baltic, and won his brevet majority at the siege of Bomarsund. In November 1855 he was seconded for work under the colonial office, partly on the Gold Coast (1855-6) and partly at the Hague and Paris in connection with negotiations concerning the Dutch and French West African colonies. Thenceforward he administered a chain of colonies, beginning with Dominica (1857-61), and proceeding through Bermuda (1861-6) and Singapore (1867-73) to Western Australia (1877-80)—see Governors. While at Bermuda he was for a short time employed on special work on the Gold Coast, and his term at Singapore was prolonged by special desire beyond the ordinary limits. During his term in Western Australia, Perth was connected by telegraph with Adelaide (1877). Retiring on 6 April 1880, he returned to England, and died on 20 August 1885. (C.B., 1865; Kt. Bach., 1867; K.C.M.G., 1877; G.C.M.G., 1881.)

J.S.B.

Orioles, perching birds belonging to the family Oriolidae, members of which are found throughout the warmer parts of the eastern hemisphere; the orioles of America belong to a distinct family (Icteridae). Two species of oriole occur in Australia—the Green Oriole

Green Oriole (*length* 11½ *in.*).

(*Oriolus sagittatus*), found in the eastern and northern parts of the continent, and the Yellow Oriole (*O. flavocinctus*), confined to the north.

Orioles frequent forest country, and live principally on bush fruits, but also devour insects. Their notes are varied and melodious, and they are capable mimics, imitating the songs and calls of other birds. Their nests are neat cup-shaped structures suspended from the forks of horizontal or drooping boughs. The eggs are from two to four in number, white, with dots and blotches of various shades of brown.

W.B.A.

Orites, a genus of the family Proteaceae, endemic in south-eastern Australia. The flowers are small, in pairs within each bract, on short spikes; corolla-segments dilated at the tips, short and concave; anthers perfect, enclosed in the concave segments; fruit a leathery follicle; seeds compressed, with a terminal oblique wing. *O. excelsa* (Prickly Ash of the Dorrigo district in New South Wales; also known as 'silky oak'), is a large tree of up to 100-120 feet, with timber so much resembling that of the true silky oak (q.v.) as to become a frequent substitute for it. Sawyers object to this timber, as it contains a mineral substance that dulls the saws.

Ormond, Francis (1829-1889), son of a merchant captain who settled at Port Phillip in 1842, was born at Aberdeen in Scotland on 23 November 1829, educated in Liverpool, and brought by his parents to Geelong, where he at first tried commercial life and then became a squatter. This occupation brought him great wealth, which he determined to spend on the encouragement of education in Victoria. Among his gifts and legacies for this purpose the principal were a sum of over £100,000 to Ormond College within the university, £20,000 to endow the chair of music at the university, and £11,000 to the Melbourne Working Men's College. His will further provided large sums for hospitals and asylums at Melbourne, Geelong, and Ballarat. He died in France, during a visit to Europe, on 5 May 1889. From 1882 till his death he was a member of the Victorian legislative council.

Ornithorhynchus. See Monotremes and Platypus.

Orthoptera, an order of insects comprising cockroaches, earwigs, mantises, stick-insects, crickets, locusts, and grasshoppers. Some of these families are in many respects highly specialized, others are the most primitive of existing winged insects; the order, indeed, might be defined as including all insects in which the mouth-parts are of a very primitive mandibulate type, the hind-wing is provided with an anal fan, and the larvae are not aquatic. The fore-wing, when present, is fairly hard and tegminal; the anal area of the hind-wing is expanded into a large anal fan, which can be folded up; cerci are present; the metamorphosis is slight, the young and adult forms showing no great differences, and the wings developing gradually through a number of instars.

Handlirsch's extensive splitting-up of this order, which has been followed in recent years by many authors, is based primarily upon a misconception as to the nature of the wing-venation, and cannot be justified. The families here given may be legitimately considered super-families, and many have been extensively subdivided. The old division into two sub-orders, Cursoria and Saltatoria, is adopted here also; the latter division is a natural one, whereas the former conveniently contains all the more archaic types. To these will be added, as a very specialized side-branch, the sub-order Dermaptera (earwigs). In Cursoria are included cockroaches, mantises, stick- and leaf-insects, in which the hind-legs are not formed for jumping and the anal fan of the hind-wing folds up only lengthwise. Saltatoria include the closely related crickets, locusts, and grasshoppers, in all of which the hind-legs are specialized for jumping. All these are discussed elsewhere under their own names. R.J.T.

Orton, ARTHUR (1834-1898), born at Wapping, London, on 20 March 1834, was the youngest son of a shipping butcher, who sent him to sea at the age of 14 in a vessel bound for Chile. The boy deserted at Valparaiso, and lived for some months with a Chilean family named Castro. In 1851 he returned to England, in 1852 migrated to Tasmania, and settled in 1864, after a more or less adventurous career, at Wagga in New South Wales, where he traded as a butcher under the name of Thomas Castro. There in 1865 a neighbour from Hampshire showed him an advertisement asking for news of Roger Charles Doughty Tichborne, heir to the estates of a Roman Catholic Hampshire family. This Roger, who was born in 1829 and educated at Stonyhurst, held for three years a commission in the 6th dragoon guards, but sold out in 1852 and went off to South America; he was last heard of in 1854, when he embarked at Rio de Janeiro in the ship *Bella*. The finding of wreckage from this ship was taken as conclusive evidence that she had foundered, and in 1855 Roger Tichborne's younger brother succeeded to the family estates. His mother, however, maintained the belief that Roger was still alive, and repeatedly advertised in British and colonial newspapers for news of him.

It was one of these advertisements that was shown to Castro-Orton, and he was gambler enough to see in it a chance of wealth. He had for some time entertained friends in Wagga with stories of a mysterious past too high for a butcher; it was notorious that he had lived in South America; and the vague description in the advertisement fitted him moderately well, except that Roger Tichborne had been slim and Orton was excessively stout (a few years later he scaled 24 stone). When, therefore, on being shown the advertisement he solemnly buried his face in his hands and refused to discuss it, the news went round Wagga, and a local solicitor, William Gibbes, jumped to the conclusion that the true Roger had been found; this belief was all the more acceptable because Orton's monetary affairs were in confusion and he had been staving off creditors with the assurance that he was expecting money from England. Urged on by Gibbes, Orton wrote to Lady Tichborne asking for money enough to pay his passage home —at this stage he seems merely to have hoped that the funds so procured would allow him to join an Orton brother who was farming in California. But public excitement over the romantic story took the ordering of affairs out of his hands. Arriving in Sydney on his way overseas, he found local 'society' waiting with open arms to receive Sir Roger Tichborne, and local bankers eager to supply him with funds; any lingering doubts of his identity were dispelled when Bogle, an old West Indian servant of the Tichborne family, professed to recognize him. From him, from his Hampshire neighbour in Wagga, and from other sources, Orton gained a great deal of information about the Tichbornes, which he used familiarly and with great effect. Funds being now available, he did not wait for the remittances from England, but took ship for Panama—ostensibly *en route* to London, actually hoping to get away to California. His fellow-passengers, however, made it impossible for him to go elsewhere than to London without exposing the fraud. So to London he went, arriving there on 25 December 1866, and thence to Paris to meet his 'mother' —who immediately recognized him, despite the fact that he had grown so stout, spoke vulgar English, and could not understand a word of French (which was almost Roger's native tongue). She handed over to him all Roger's papers and family letters, and allowed him £1000 a year. On his return to England he set himself to find out details of the Tichborne home, visited the neighbouring villages, and there told stories that left most of the villagers without a doubt as to his identity; he also took into his personal service a man from the 6th dragoons, who made him familiar with the regimental jokes and stories. Consequently a number of prominent persons, delighted to have their memories refreshed with stories of the long-ago, welcomed 'Sir Roger' home again.

The Tichborne estates, however, remained in the possession of the younger brother until his death, and then were held in trust for his infant son, for none of the Tichbornes except the dowager admitted the newcomer to the family circle. Lady Tichborne died in April 1868, and Orton, soon finding himself penniless, on 11 May 1871 brought a civil action for the recovery of 'his estates;' to finance him, £40,000 was raised by the issue of Tichborne bonds to the public. Meanwhile the trustees of the estate had learned that on the evening of his arrival in London he had visited Wapping and inquired after the Orton family, and that members of the family had received money from him. Moreover, his handwriting and appalling spelling agreed very well with the handwriting and spelling of letters written by Arthur Orton to an old sweetheart in Wapping. The trustees, therefore, not only denied that he was Roger, but maintained that he was Orton. The action dragged on over many months (from 11 May 1871 to 5 March 1872, the actual trial occupying

102 days), owing to the necessity of taking evidence in South America and Australia: Orton was at last nonsuited, and chief justice Bovill immediately had him arrested for perjury. During his trial, which opened on 22 April 1873, the British treasury in response to public pressure —at least half England being convinced that Orton was Roger—defrayed the expenses of his witnesses. On 28 February 1874 he was sentenced to 14 years' penal servitude, and his counsel, Dr. Kenealy, was severely castigated by the chief justice. On 19 October 1884 Orton was liberated, an act of parliament having meanwhile declared Roger Tichborne to be dead, and having conferred on the actual holders of the estates power to deal with them as they wished. On 9 April 1895 Arthur Orton published in *The People*, a London newspaper, a full confession of his guilt. On 1 April 1898 he died.

Orton, Joseph (1795-1842), born at Hull in England on 1 October 1795, is first heard of as a Wesleyan missionary in Jamaica, where he was imprisoned for six months in 1826 for preaching to slaves after sunset. Returning to England, he took up work in the Bury St. Edmunds circuit, and in 1831 migrated to Sydney, where four years of his wise administration reestablished the mission. After a visit to New Zealand, he established Methodism in West Maitland and Bathurst; on 18 May 1834, with the help of George Allen, he established the Sunday School Society. On 24 February 1836 he left Sydney for Hobart to superintend the newly formed district there, and in April visited Port Phillip, where on the 24th he preached to aborigines and settlers, William Buckley (q.v.) acting as his interpreter. It was on his recommendation that Gipps granted 64,000 acres at Buntingdale for an aboriginal reserve. On 2 March 1842 he sailed in the *James* for England and died while rounding Cape Horn in April. His manuscript journals give interesting details of his journeys, his services to the Church and to convicts, and his public movements.

J.C.

O'Shanassy, Sir John (1818-1883), born in county Tipperary in 1818, migrated to Australia in July 1839, reached Melbourne on 15 November, was persuaded by Father Geoghegan (q.v.) to stay there rather than go on to Sydney, and bought a small station near Western Port; but, lacking capital and confronted by scab in his flock, he abandoned the run, opened a draper's shop in Melbourne in 1846 and soon (mainly by his wife's energy) established a thriving business, which during the gold-rush of the early fifties became the source of a substantial fortune. In Melbourne he was from the first involved in local politics. He helped to found the anti-transportation league, ardently advocated the separation of Port Phillip from New South Wales, and when this was achieved became on 11 September 1851 one of the three elected representatives of Melbourne in the new legislative council. Here he practically led the opposition, attacking the nominee element with vigour and urging the early grant of fully responsible government. Sir Charles Hotham, recognizing his ability and sincerity, placed him on commissions to enquire into the state of the goldfields (after the Eureka Stockade business, q.v.), to report on the proposed constitution (1853), and to investigate the state of the crown lands (1855). When the colony obtained self-government in 1856, O'Shanassy was elected to the assembly by both Melbourne and Kilmore, and chose the latter. Again he led the official opposition—this time in co-operation with C. G. Duffy (q.v.)—and in March 1857 defeated the Haines ministry and formed one of his own; this, however, was but a scratch team, and lasted about six weeks. Haines, returning, held office for slightly over ten months; then O'Shanassy with a strengthened team came back for nearly 20 months. The two next ministries used up two years in fruitless attempts at land legislation that should encourage agriculture at the expense of pastoral settlement. On 14 November 1861 O'Shanassy for a third time took office, with an experienced team that might almost be called a coalition, and passed a crown lands act (usually known by the name of its deviser, Duffy) and a local government act that did good work for another ten years. Defeated in June 1863, and succeeded by one of the strongest ministries that have ruled Victoria, he never saw office again; he remained in the assembly until 1866, then visited Europe and was knighted by Pope Pius IX for his services (which were great) to Roman Catholics in Australia; returning in 1868, he was elected to the council, but resigned in 1874; finally he secured election to the assembly in 1877 as member for Belfast, and on his rejection by that constituency in 1883 took to his bed and died on 7 May of that year.

Till the end of his premierships O'Shanassy was regarded as an advanced liberal and an enemy of the squatter interest, but he never loved universal suffrage or vote by ballot. In later years his conservative temperament mastered him, mainly because the new liberalism was identified with protection, state education, and other measures to which his religion or his habit of mind opposed him. From first to last he warmly supported any movement that tended towards increased immigration or Australian federation—in the latter connection he joined Duffy's committee of 1857, which brought South Australia and Tasmania into harmony but was thwarted in its federal desires by the coldness of New South Wales. From first to last his political work was marked by great parliamentary capacity, and entirely untainted by any suspicion of self-seeking. (C.M.G., 1870; K.C.M.G., 1874.)

Osmiridium. This alloy of osmium and iridium, usually found in small particles associated with an ore of platinum, exists in separate deposits at several places on the west coast of Tasmania. These have been worked steadily (except for an interval in the early days of the war) since 1911; in that year 271 oz., valued at £1188, were won, but in 1923 (the last available official figures) the yield was 673 oz., valued at £19,642. The record yield was in 1920, when over 2000 oz. were obtained; in October the price was £42 per oz. The work is unorganized, and is carried on by prospectors. In 1925 a new field was opened up on the Adams River, which in a few months produced £74,000 worth of metal and at the end of November was yielding £1000 worth a day. In 1926 there were over 500 miners at Adamsfield, and the conditions were much the same as in the diggings Bret Harte described; revolvers were worn, and a vigilance committee had been appointed.

Osmiridium is used chiefly for hardening platinum jewellery and the points of gold pens, for making watch-bearings, and—since increased production has reduced the price—for pointing drills for special work. See Mineralogy.

Osprey. See Hawks.

O'Sullivan, EDWARD WILLIAM (1846-1910), born at Launceston in Tasmania on 17 March 1846, and educated principally by his mother, was at an early age apprenticed to the printing trade on the Hobart *Mercury*. After a visit to Sydney in 1869-71 he established in Hobart the *Tasmanian Tribune*; after two years he sold out, and in 1874 established in Melbourne another *Tribune*, an evening newspaper run on co-operative lines, which was unsuccessful. For four years he was editor of the *St. Arnaud Mercury*, then returned to Melbourne to join the *Argus*, and in 1882 left the *Argus* for the Sydney *Daily Telegraph*. A year later he found that press work interfered with his political interests; in Victoria he had supported Graham Berry, and in New South Wales adopted even more advanced views. He was a strong advocate of the 8-hour movement, early closing, protection, arbitration, courts of conciliation, and woman suffrage. In 1882 and 1885 he stood for parliament without success. In 1885 elections were not all held on the same date, and on the night of his defeat (for South Sydney) he took train for Queanbeyan, where he had at the moment no supporters and no organization; in seven days he had won the seat against four others, to hold it for 19 years. In 1904 he won the Belmore electorate in Sydney, and retained the seat till his death.

In 1896 O'Sullivan was chairman of the first parliamentary committee on old-age pensions, and in 1899 took office under Sir William Lyne as secretary for public works; he retained this post under John See (1901-4), and in 1902-3 seized the opportunity that made him memorable. In 1902 a severe drought depressed New South Wales; O'Sullivan, foreseeing a recovery, and knowing that a bold public works policy would relieve the immediate depression and justify itself in more prosperous years, induced the treasurer to borrow heavily for railway extensions and similarly productive works. In 1895-9 New South Wales had appropriated about 13½ millions for public works, in 1905-9 the amount was about 10½ millions; in 1900-4 O'Sullivan used nearly 18 millions. At the time he was violently denounced for unprecedented recklessness, but his policy justified itself by its results, and his expenditure has in recent years been many times exceeded—in 1920-4, for instance, the state's loan expenditure reached 51½ millions. In the short-lived (June-August 1904) Waddell ministry O'Sullivan was minister for lands; after that time he sat in opposition until his death, which took place at Sydney on 25 April 1910.

In the late nineties O'Sullivan had returned to his old pursuit of journalism, editing for three years (1897-9) the *Freeman's Journal*. He was a voluminous writer of articles and pamphlets, and in 1906 published in Sydney *Under the Southern Cross*, a collection of articles, stories, and speeches. But his real value to Australia lay in his gift of imagination and prescience; since Macquarie's time no other man has so nearly equalled that great governor in foreseeing and providing for future expansion.

Ovens, JOHN (1788-1825), born in Ireland and educated for the Church in Dublin, changed his mind and entered the army in 1808 (ensign, 1808; lieutenant, 1810; captain, 1819; major, 1824). The next year his regiment (the 73rd) was despatched with its colonel, Lachlan Macquarie (q.v.), to New South Wales; on arrival Ovens was promoted lieutenant and made engineer and artillery officer for the colony, an appointment which seems to have involved the superintendence of public works in general. At the end of 1811 he obtained leave of absence, returned to England, joined the 2nd battalion of his regiment, and (finding it was not on the roster for war service) exchanged into the 74th; this regiment was serving in the Peninsula under Brisbane, who was one of the brigadiers of Picton's 3rd division, and Ovens seems to have come almost at once under Brisbane's direct notice. He was severely wounded at Vitoria, but recovered in time to be present at Orthes and Toulouse, though the effects of the wound lasted many years. During the last years of the war he was probably on Brisbane's staff, and Brisbane, when in 1821 he was given the governorship of New South Wales, invited Ovens to go with him as aide-de-camp, and soon after they reached Sydney made him chief engineer. We hear no more of him until in May-June 1823 he accompanied Captain Currie on a tour past Lake George to the upper Murrumbidgee and the edge of the Monaro district; this is usually spoken of as the 'discovery' of the Murrumbidgee, but R. H. Cambage has made it clear that Throsby reached that river in 1821. In 1824 Ovens's long service had its reward. Brisbane obtained for him his brevet majority, made him his private secretary—a proceeding which greatly annoyed the official secretary, Frederick Goulburn—and commended him to Bathurst 'under the solemn impression that no public officer here has rendered me the same essential service, the Colony such general benefit, or imposed upon the Mother Country such a heavy debt of gratitude.' But the load grew too heavy, and on 7 December 1825 he died. He was buried on Garden Island, in a plot already occupied by the coffin of Ellis Bent (q.v.), and when that cemetery was evacuated the two bodies were reinterred under a single tombstone at St. Thomas's cemetery in North Sydney.

Ovens's name was given by Hume and Hovell to the first stream they reached after crossing the Hume-Murray; they thoughtfully held the balance even by naming the next stream the Goulburn. Another John Ovens almost immediately appeared in New South Wales: this officer, a lieutenant in the 57th regiment, must not be confused with Major Ovens of the 74th. See EXPLORATION BY LAND.

Overlanding. See PASTORAL INDUSTRY.

Overland Telegraph-line, THE. There are now several telegraph-lines in Australia that might claim this name; but the first so called, and the one best known by the name, stretches from Port Augusta at the head of Spencer Gulf in South Australia to Port Darwin in the Northern Territory—approximately 1800 miles—and links the Commonwealth with Asia and Europe by a connecting cable to Banjuwangi in Java.

Up to 1872 the mail-service between Australia and Europe was carried on once a month by the Peninsular and Oriental Navigation Company, heavily subsidized by the colonial governments. The lack of a more speedy means of communication with Europe was a great restraint on business, and negotiations were therefore initiated by Queensland, and by South Australia (which then controlled the Northern Territory) with the British-Australian Telegraph Company; in the end the South Australian proposals were accepted, and in June 1870 the company made an

agreement with the government of the day to lay a cable from Java—which was already connected with Europe—on condition that a land line was constructed from Port Augusta to Port Darwin. The whole line, by land and sea, was to be open for use on 1 January 1872. At this time the South Australian population was little over 180,000; but they cheerfully accepted the task of constructing what was then estimated at 1500 miles of telegraph-line through a country which had up till then been only once traversed from south to north—by John McDouall Stuart (see EXPLORATION BY LAND). The ultimate cost was over £300,000.

The only hills worthy of mention on the route chosen for the line are the Macdonnell Ranges, and a pass was known through them. It was decided that the construction of the line should be divided into three sections, No. 1 proceeding due north from Port Augusta, and No. 3 from Port Darwin due south; No. 2, through the ranges, was looked on as the most difficult.

The supervision of the line was entrusted to Charles Todd (q.v.), postmaster-general and superintendent of telegraphs, an Englishman who had been appointed in 1855 to establish a telegraph system in the colony. Section No. 1 was constructed by Edward Meade Bagot under contract, and was completed in 15 months; the central section, undertaken by the government, was also finished within little more than the estimated time, although in both these sections immense difficulties were caused by lack of water and suitable timber, the absence of roads, and the great distances over which material and stores had to be hauled. Section 3, which was let to an Adelaide firm, was unexpectedly found to be the most troublesome owing to the swampy nature of the country, the annual rainfall in that part of the Northern Territory being about 70 inches. No time was lost in starting. The contractors planted the first pole at Port Darwin on 15 September 1870, but progress was so slow that the government official in charge of the section found it necessary to terminate the contract. An engineer with a party of 80 men was sent up on 27 July 1871 from Adelaide, but the flooded country baffled him also; and it was not until Todd, with another large party, came to his aid, after the difficulty had been vainly attacked from the Roper River, that a route was found which, owing to the partial drying of the swamps, admitted of slow but steady progress.

On 22 May 1872 Todd sent the first message from Port Darwin to Adelaide, but—as part of the third section was still incomplete—it had to be conveyed by horsemen for considerable distances, and did not reach the capital until 20 June. On 22 August the line was completed and the first through message from Port Darwin was received. The cable company, however, had its own difficulties, and before the land line was completed the cable from Java was interrupted, so that the first through message from London did not reach Adelaide until 22 October. On the 30th Todd returned to Adelaide and reported that he had inspected the line for the entire distance from Port Darwin to Adelaide, and that it was constructed in a substantial manner, but required iron poles in many places where timber was liable to destruction by white ants or bush-fires. The line has since been entirely repoled with iron poles.

The line took 23 months to build. Some 36,000 telegraph-poles, weighing 5000 tons, were used, some being carted to a distance of 350 miles; a large number of iron poles were hauled from 400 to 500 miles, and over 200 tons of other materials were carried into the interior. Several thousand sheep and cattle were driven an average of 500 miles to supply the constructors with food; the scrub timber had to be cut, grubbed, and cleared for an average width of 50 feet over some 500 miles; large quantities of building-stone, sand, etc. for the permanent stations had to be carted inland, and a receiving station of 22 rooms for the cable and land lines was erected at Port Darwin. The other telegraph-stations, which are about 200 miles apart, were completed some time afterwards. Fortunately, the natives along the route gave very little trouble, and not a single white man was killed during construction. See PACIFIC CABLE.

E.W.G.

Owen, SIR WILLIAM (1834-1912), born on 4 November 1834 and educated at Cheltenham and at Trinity College, Dublin, was called to the Irish bar in 1859 and, migrating to Sydney the next year, was at once admitted to that of New South Wales. Devoting himself to his profession (with the exception of a very short period of work in the public service in 1865), he became a Q.C. in 1882, and in October 1887 was made chief judge in equity, transferring to the common law side in 1896. In 1892 he was a member of the commission which investigated charges brought by a member of parliament against the chief commissioner for railways. In 1905 he was given sole charge of the investigation into scandals connected with the administration of crown lands, and afterwards was made head of a tribunal which cancelled many wrongly obtained leases, and whose decisions, when questioned, were expressly validated by act of parliament. In 1908 he retired from the bench into private life, and died on 22 November 1912. (Kt.Bach., 1906.)

Owenia, a genus of the family Meliaceae, consisting of trees with sprays of small flowers and succulent fruits; the stem and branches usually contain a milky juice. The five species indigenous to Australia are endemic. *O. acidula* (Native Peach, or Nectarine, but better known by its aboriginal names 'gruie' and 'colane') is an inland species, confined to New South Wales and Queensland; it is considered one of the handsomest trees on the western plains, and is a valuable stand-by for stock in time of drought. The sub-acid fruits, which will relieve thirst, and are eaten by both aborigines and settlers, are of a crimson colour and the size of a small nectarine. The stones are made into bracelets and other ornaments. *O. cepiodora* (Onion-wood) is a medium-sized tree confined to the coastal brush forests of northern New South Wales and Queensland; its popular name is derived from the smell of the wood, which, however, soon disappears after cutting. *O. cerasifera* is the Queensland Plum; its red juicy fruit is very acid when fresh, but if buried in sand for a day or two is very refreshing. *O. venosa* (Sour Plum), also a Queensland species, produces a large acid fruit. That of *O. acidula* (Emu-apple) is eaten by natives in northern Queensland.

Owlet. See FROGMOUTHS AND NIGHTJARS.

Owls, nocturnal birds with powerful hooked beaks and sharp claws, belonging to the order Strigiformes. Two families are represented in Australia, each by five species. The brown owls (Strigidae) include the largest Australian

species, the Powerful Owl (*Ninox strenua*), a somewhat rare inhabitant of forest country along the eastern coast, whose nocturnal cry is said to resemble the bellowing of an ox; and the well-known smaller Boobook Owl (*Ninox boobook*), whose cry is one of the most familiar sounds in the bush at night-time. Nowadays the call is generally represented by the words 'more-pork' or 'mopoke,' and it is commonly (but erroneously) supposed that the sound is made by the frogmouth (q.v.), on which the name 'mopoke' has been conferred in consequence.

The barn owls (Tytonidae) include the beautiful pale buff or whitish Delicate Owl (*Tyto alba*)—identical with the English barn owl, white owl, or screech owl—and the similar but larger Masked Owl (*Tyto novae-hollandiae*), peculiar to Australia.

Boobook Owl (*length* 16 *in.*).

In Australia, as in other countries, owls are commonly classed with hawks, dingoes, foxes, etc., and regarded as noxious; yet they are beyond question among the most valuable birds, since they keep down the numbers of rodents and of the larger nocturnal insects. Owing to the fact that owls bring up the harder portions of their food, and eject them from the mouth in pellets, it is possible by collecting the pellets from beneath the birds' roosting-places to study their feeding habits without destroying them. A long series of observations, made by Captain S. A. White of Adelaide on a pair of delicate owls inhabiting his grounds, proved that they fed almost entirely on mice, rats, and insects, sometimes also obtaining starlings and sparrows. An examination of numerous pellets of the boobook owl indicates that this species feeds almost entirely on insects, but occasionally captures mice and small birds. W.B.A.

Oxley, JOHN (1781-1828), born in Yorkshire in 1781, entered the navy as a lad and reached Australia in H.M.S. *Buffalo* in 1802 as acting-lieutenant (he had served his full time for the rank, but until 1806 had no opportunity of passing the necessary examination). In 1804 he helped Robbins to survey Western Port, and on 18 March 1805 was given his commission as lieutenant without examination; he then commanded the *Buffalo* (November 1805) and *Estramina* (April 1806). In 1807 he returned to England in the *Buffalo*, coming back in November 1808 in the transport *Speke* to become 1st lieutenant in the *Porpoise*. In that ship he again returned to England in 1810, but on the recommendation of Matthew Flinders was in July 1811 appointed surveyor-general of New South Wales, and reached Sydney on 1 January 1812. He was already a landowner in the colony, having been granted 600 acres at Kirkham near Camden in 1808, and 1000 more by Paterson in 1809; the Paterson grant was at first disallowed by Macquarie, but was confirmed in 1815. Macquarie employed him very actively beyond the Blue Mountains, where in 1815 he planned the town of Bathurst and in 1817-18 made important explorations that are described under EXPLORATION BY LAND. In 1823 he was sent north along the coast to look for a new penal settlement site (see EXPLORATION BY SEA) and in the course of his voyage discovered the Brisbane River. In June 1825 he commenced a survey of the settled districts of the colony into counties and parishes, and was still engaged on this work when he died at Kirkham on 26 May 1828.

Apart from his work as surveyor-general, Oxley did the colony good service in many ways. Macquarie found him a valuable if sometimes obstinate adviser, and it was mainly his doing that, after 1821, grants to new settlers had to be properly surveyed before they were handed over. His politics were 'exclusive,' and he opposed trial by jury. In 1823 he was made a member of the legislative council, but was left out of it when Darling arrived. As an official he disliked private explorations and did his best to block the Hume-Hovell expedition of 1824; he also objected to the settlement of Western Port in 1826 and to other attempts made by Darling to anticipate a supposed French project of annexation. Darling described him as 'a clever man but too little controlled;' he added, however, that Oxley was 'a philanthropist almost in the extreme, often led by injudicious zeal, but indefatigable, conscientious, and honourable in the highest degree.' In 1822 he published in London his *Narrative of Two Expeditions into the Interior of New South Wales* (London, 1820); Barron Field's *Geographical Memoirs on New South Wales* (London, 1825) contains his report on one of his expeditions. J.V.C.-B.

Oxylobium, a genus of the family Leguminosae, endemic in Australia, consisting of shrubs with (chiefly) yellow flowers, many of them highly ornamental. *O. parviflorum* is the Box Poison-plant, and *O. retusum* the Bloom Poison-bush—a name also given to a *Gastrolobium* (q.v.); *O. lineare* and *O. capitatum*, also regarded as poison-bushes, are confined to Western Australia; *O. trilobatum* (Native Holly), is an ornamental shrub with holly-like leaves and showy flowers; *O. scandens* is a pretty climber.

Oyster-catchers. See WADERS.

Oysters and Oyster-culture. The Australian coast is plenteously endowed with oysters, of which two species are of commercial importance, namely, the Rock Oyster (*Ostrea cucullata*) and the Mud Oyster (*O. angasi*). The

mud oyster, although very much larger than the rock oyster, is of comparatively little value commercially, as it is of inferior flavour and its keeping qualities are poor. It occurs in marketable quantities only on the southern coast, the principal fishery being at Port Lincoln in South Australia; in the early days of settlement, however, immense quantities were found in New South Wales as far north as Port Jackson. The term 'mud' oyster is in reality a misnomer; it does not live in the mud, but is found on a firm bottom, in rock-crevices or actually attached to rocks, below low-tide mark. It is nowhere cultivated, attempts to do so having proved unsuccessful. Like the English oyster, it is hermaphrodite, and the eggs are fertilized in the mantle cavity, considerable development taking place before they are ejected into the water.

The rock oyster, which flourishes from mean high-water mark to depths of 50 feet or more, occurs round the whole coast of Australia, with the exception of the southern seaboard. The maximum degree of development is attained on the east coast between the Tropic of Capricorn and 38° S. lat. Outside Australia it is found in India, Japan, and northern New Zealand. Its keeping qualities are excellent, its flavour probably unsurpassed. The sexes are distinct; the sperms and ova are liberated direct into the water, where fertilization takes place. The time of spawning varies, but is generally expected in late summer.

The cultivation of the rock oyster forms an extensive industry, particularly on the coast of New South Wales. The culture-grounds are situated in inlets and estuaries where the salt water extends inland for many miles. Cultivation is practised either on the foreshores and mud-flats between high and low water, or below low-water mark. In the latter case immature oysters are dumped from punts on a firm level bottom, and when fully grown are gathered with dredges, or occasionally by divers. Grounds suitable for this type of cultivation are now limited, on account of the destruction caused by the mud-worm (for which see lower down).

For cultivation above low-water mark four principal methods are employed, the oysters being grown on (*a*) stone slabs (usually sandstone) stuck upright in the mud or laid on a bed of poles; (*b*) sticks, placed either singly or in bundles; (*c*) maturing-beds, either formed naturally by a firm and level bottom, or built up of mud and dead shells and drained by channels; (*d*) wire-netting stretched over frames and supported on posts clear of the mud (see plate xxxii). Of these (*a*) and (*b*) are by far the most extensively used in New South Wales, and, whereas stone has the advantage of permanence, the stick method gains in ease of transportation. The sticks used are obtained principally from the Black Mangrove (*Aegiceras majus*), which grows on the banks of many rivers; Swamp Oak (*Casuarina glauca*) and White Honeysuckle (*Banksia integrifolia*) are used to a less extent. These trees are chosen because they resist the attacks of 'cobra' (ship-worm) long enough to allow the oysters to mature—a process which usually takes about three years. Bundles of sticks are laid out to catch spat on grounds where oysters attach in abundance; when the shells are sufficiently strong (at from 6 to 12 months) they are transported on punts to fattening-grounds, where growth is much more rapid. Here the sticks are thrust into the mud singly and upright, from one to two feet apart. Speaking generally, breeding-grounds are found near the mouths of estuaries, and fattening-grounds are situated higher up, where the water is brackish. Methods (*c*) and (*d*) are used exclusively for developing immature oysters, which are scattered over the surface and left to mature. Both types are commonly adopted in New South Wales and Queensland.

The chief pests are the Mud-worm (*Polydora ciliata*), boring whelks, several species of fish, and a turbellarian worm known as the Wafer (*Leptoplana australis*). In certain rivers floods occasionally do much damage. The mud-worm is by far the worst enemy, and not only takes toll of great quantities of oysters, but in many localities renders otherwise valuable ground useless for culture-purposes. It crawls into the shell when the oyster is feeding, and gathers a deposit of mud over which the oyster is forced to build a layer of nacre. Continued invasions weaken the oyster, and eventually kill it. Most damage is done in muddy localities near low-tide mark, and in deep water. The whelks comprise several species, which by means of their rasp-like tongue (radula) bore small round holes in the shells of young oysters, and then devour the flesh. The fish pests are mullet (*Mugil* spp.) which consume the eggs and free-swimming larvae, stingrays, porcupine- and toad-fishes, and the Black Bream (*Sparus australis*).

Rock oysters are marketed in 3-bushel bags, the great majority being carried by steamer from the rivers of New South Wales to Sydney, whence large quantities are transhipped to Melbourne, Adelaide, and Fremantle. Queensland also exports to the other states, but, owing to the ravages of the worm, the supply from this source is much less than formerly. Upwards of £140,000 worth of oysters are produced in Australia annually; of this amount New South Wales in 1925 contributed £92,774 and Queensland £32,548. During 1925 Victoria imported 10,234 bags of rock oysters (valued at £40,936) from New South Wales and Queensland—chiefly the former—and 1784 bags, principally of mud oysters (valued at £2676), from New Zealand, besides marketing a certain amount grown locally. In the Melbourne market the mud oyster brings from one-third to one-half the price of the rock oyster.

No oysters are canned in Australia. Oyster-bearing grounds are let by the government at rentals ranging from 5s. to £5 per annum per hundred yards of foreshore (or per acre of off-shore leases) according to productiveness.

See T. C. Roughley's *Oyster Culture on the George's River, New South Wales* (Sydney, 1922) and *The Story of the Oyster* (1925). T.C.R.

Oysters maturing on wire netting frames, George's River, N.S.W.

Stone cultivation, George's River, N.S.W.

Mangrove stick cultivation, Port Stephens, N.S.W.

P

Pacific Cable, The. Up to the end of 1902 telegraphic communication between Australia and England was carried on over lines that traversed foreign countries and cables that at many places lay beneath alien waters. As far back as 1879 the inconvenience of this arrangement had been pointed out by Sandford Fleming, chief engineer of the Canadian government railways, who suggested that advantage might be taken of the extension to the Pacific coast of the Canadian Pacific Railway (and its telegraph-lines) to link up the British colonies in the western Pacific by a submarine cable. The proposal was discussed at the colonial conference of 1887 (see Imperial Conferences). The Ottawa conference of 1894 resolved that Britain should be asked to survey a route, Canada and the Australasian colonies sharing the expense. In 1896 a Pacific Cable Committee under the chairmanship of Lord Selborne reported in favour of the scheme, and in 1901 an Imperial act authorized the construction of a cable from Vancouver Island to New Zealand and to Queensland. The work was completed in October 1902, and the cable opened for use on 7 December.

During the preliminary discussions it was decided that ownership of the cable should be vested in the governments concerned, their shares being allotted as follows:—out of 18 shares in all, five to Britain, five to Canada, and two each to New South Wales, Victoria, Queensland, and New Zealand. After federation the Commonwealth government took over the obligations of the three Australian States, and thus owns six shares. The act of 1901 created a managing board of eight members, three representatives of Britain, two of Canada, two of Australia, and one of New Zealand. Management is centralized in London, though a 'manager in the Pacific,' stationed at Sydney, is responsible for the working of the cables and cable-stations and the conduct of business in Australasia.

The first cable was laid from Bamfield on Vancouver Island to Fanning Island (3458 nautical miles), thence to Suva in Fiji (2043 miles), thence to Norfolk Island (982), and thence to Southport in Queensland (837)—a total length of 7320 miles. A branch ran from Norfolk Island to Doubtless Bay in New Zealand (519 miles). In 1912 the land lines from Doubtless Bay to Auckland were replaced by cables (199), and an alternative route was also provided between Auckland and Sydney (1251); and in 1923 Southport was connected with Sydney (510) and Auckland with Fiji direct (1255). The Bamfield-Fanning Island and Fanning Island-Fiji sections are in process of duplication; the new cables, which have twice the working capacity of those first laid, will be ready for use in October 1926. The stretch from Bamfield to Fanning Island is the longest in the world covered by one cable. Yet neither on this stretch nor on that from Fanning Island to Suva has there been any interruption to traffic in 23 years, except when in 1914 the German cruiser *Nürnberg* cut the cables at Fanning Island as an act of war. This immunity from natural harm is mainly due to the depth at which the cable lies (often over 3000 fathoms), and to the singularly even character of the ocean-bed.

The capital cost of the original enterprise was about £2,000,000, which was provided by the British government at 3 per cent, to be repaid in 50 annual instalments of £77,545. It was further provided that a sum of £39,150 should be set aside annually for repairs and renewals. The finances of the cable were thus burdened from the first with fixed payments amounting to nearly £117,000 a year, and consequently no profits were shown until 1916. The annual deficits—which were borne by the governments in proportion to their shares—decreased from £87,000 odd in 1903-4 to less than £8000 in 1914-15, and from 1916 onwards the profits have been devoted either to strengthening the repair and renewal fund or to reducing the capital debt. On 31 March 1925 this debt amounted to £1,306,665, whereas the reserve and renewal fund had to its credit £2,279,826, after meeting the cost of all the additional cables.

The increase in traffic is illustrated in the following table:—

Year.	Words—Ordinary.	Government.	Press.	Special.	Total.
1902–3	202,313	24,210	1,831	...	228,354
1907–8	1,041,433	105,519	84,940	...	1,231,892
1912–3	1,288,949	193,688	717,942	460,228	2,660,807
1917–8	2,186,917	2,443,299	361,328	2,461,174	7,452,718
1922–3	3,813,294	476,122	1,056,963	4,641,224	9,987,603
1924–5	3,481,708	418,877	1,058,345	6,930,470	11,889,400

Incidentally it may be noted that the increase was not so steady as this table may imply. It was steady up to 1914-15; during the next year it doubled (from four to eight million words), mainly because of a great expansion in the special-rate ('deferred' and 'week-end') messages; in the period 1917-20, though special-rate and press messages fell away, there was a huge increase in government messages, probably due to the peace negotiations; since 1921 the increase has again become steady. The sudden increase in special-rate messages in 1924-5 is accounted for by the institution in September 1923 of 'daily letter telegrams' transmitted at a reduced rate after the ordinary messages are dealt with.

Padbury, Walter (1820-1907), born at Stonestill in Oxfordshire in 1820, migrated with

his parents to Swan River in February 1830, and owing to the death of his father a few months afterwards, had to make his own way in life. At the age of 16 he became a shepherd, and as time went on seized the opportunity of taking up pastoral pursuits, which he followed throughout his life, being interested at the same time in many commercial ventures. In 1874-6, and again in 1885, he was president of the Royal Agricultural Society of Western Australia, and sat for five years as a member of the old legislative council before the introduction of responsible government. Dying on 18 April 1907, he bequeathed large sums to various church and charitable institutions—the largest being to the government homes for old men and women, which benefited to the extent of over £30,000.

J.S.B.

Paddy's Lucerne. See SIDA.

Palaeontology. The general factors governing distribution and the evolution of faunas are mostly of a cosmopolitan type, modified only by the major changes in the distribution of land and oceanic spaces which are dealt with under GEOLOGY (q.v.). The Palaeozoic fauna of Australia is cosmopolitan, no definitely Australian fauna being recorded until the Permo-Carboniferous age.

CAMBRIAN.—Fossiliferous limestones and shales of this age occur in Western Australia, South Australia, Queensland, the Northern Territory, Victoria, and Tasmania. *Olenellus* beds with *Salterella* occur in the Kimberley district of Western Australia. On Yorke Peninsula in South Australia Archaeocyathinae limestones are well developed, as well as beds containing *Micromitra, Kutorgina, Obolella, Nisusia, Eoorthis, Hucnolla, Stenotheca, Ophileta, Salterella, Hyolithes, Dolichometopus, Conocephalites, Olenellus, Microdiscus,* and *Ptychoparia.* At Beltana occurs the most important horizon of Archaeocyathinae so far discovered; eight genera and 32 species have already been described. From Ekeldra in the Northern Territory, *Agnostus, Paradoxides, Microdiscus* and *Ptychoparia* have been recorded. In Victoria (north-eastern Gippsland, near Mount Wellington) occur limestones with *Plectorthis, Lingulella, Scenella, Agnostus, Ptychoparia,* and *Crepicephalus.* The Heathcotian beds containing *Dinesus* and *Notasaphus* may be either Cambrian or Cambro-Ordovician. In Tasmania Archaeocyathinae occur, and in the north quartzites yielding *Dikelocephalus* and *Concephalites.* Cambrian beds with *Ptychoparia,* etc., occur near Mount Isa in northern Queensland.

ORDOVICIAN.—Horizons of Lower Ordovician age which occur in Victoria and South Australia form a remarkable example of the world-distribution of a type of pelagic organisms, the graptolites. Typical developments range from Cambro-Ordovician to Upper Ordovician, and the fauna of the various horizons have more than a general similarity to those of beds of corresponding age in Europe and America. The older beds occur in southern areas; the Upper series extends into central-western New South Wales from Cooma to Peak Hill and as far north as Tallong near Marulan. The graptolite-bearing series of slates and altered rocks are subdivided as follows:—

Upper Ordovician—Gippsland and N.S.W.
Lower Ordovician—Darriwillian
Castlemanian
Bendigonian
Lancefieldian

The Upper Ordovician beds are characterized by the abundance of *Diplograptus, Climacograptus, Didymograptus,* and *Leptograptus.* The Darriwillian may in its faunal aspect be regarded as a series of passage-beds between Upper and Lower Ordovician. The underlying Castlemanian contains a preponderance of *Didymograptus,* in the Bendigonian *Phyllograptus, Tetragraptus* and *Bryograptus* are typical, and at Lancefield *Bryograptus* and *Dictyonema. Phyllograpti* of many species are typical in all the Lower divisions.

In central Australia Ordovician limestones contain *Endoceras, Orthoceras, Asaphus* spp., *Ctenodonta, Raphistoma,* and *Ophileta.* In Tasmania the Gordon River limestones with *Cyrtodonta, Ctenodonta, Tellinomya, Bellerophon, Helicotoma, Hormotoma, Raphistoma* may prove to be of Silurian age. Ordovician brachiopods and trilobites are also found in the valley of the Florentine River.

SILURIAN.—This series occurs entirely in the eastern States, and is of a cosmopolitan type; the fossiliferous limestones and shales of New South Wales and Victoria may be in part correlated with the Wenlock and Ludlow beds. There is an abundant molluscan, brachiopod, trilobite, and coelenterate fauna, the main characteristics being the great variety of *Halysites* (in New South Wales), *Tryplasma, Spongophyllum,* and *Rhizophyllum,* and the presence of endemic rugosa such as *Mucophyllum, Mictocystis, Arachnophyllum, Vepresiphyllum,* etc. *Conchidium* and *Barrandella* horizons are well developed in New South Wales.

DEVONIAN.—These strata occur in Western Australia, Victoria, New South Wales, and Queensland. In Western Australia the Kimberley, Napier Range, and Gascoyne River beds contain a Lower or Middle Devonian fauna—stromatoporoids, *Cyathophyllum, Phillipsastrea,* tabulate corals, and *Atrypa reticularis*; but some fossils recorded from these beds belong to adjacent Permo-Carboniferous areas. In Gippsland (Victoria) Middle Devonian limestones with *Spirifera yassensis* and *Receptaculites* are well developed. Freshwater Upper Devonian or Lower Carboniferous beds contain *Archaeopteris, Sphenopteris,* and *Cordaites*; these beds also occur in southern New South Wales. In New South Wales the Lower Devonians, which are well developed in the Murrumbidgee district, are characterized by a great development of *Receptaculites,* one species attaining a diameter of at least a foot. Tabulate corals are abundant. The typical fossils are species of *Actinocystis, Diphyphyllum,* and *Spirifera yassensis.* The Middle Devonian, developed in the western districts, contain varieties of *Spirifera cristata* and pterinoid bivalves, etc.

The Upper Devonian sediments of New South Wales are of two types; the arenaceous of the western districts, containing *Rhynchonella pleurodon, Spirifera disjuncta,* and *Lepidodendron australe,* and that of the New England district, composed of coralline and radiolarian limestones, claystones, and cherts. The limestones contain such corals as *Favosites, Heliolites, Sanidophyllum, Spongophyllum, Diphyphyllum,* and *Syringopora*—all species distinct from the Silurian and possessing little in common with the Lower Devonian series. The limestones and cherts comprise a great development of interbedded radiolarian rocks near Tamworth. The upper mudstones contain *Lepidodendron australe* in abundance. In Queensland the Fanning River and Burdekin limestones are coralline, and con-

tain abundance of *Alveolites, Araeopora, Campophyllum, Stringocephalus, Atrypa,* etc.

CARBONIFEROUS.—Beds of this age occur in New South Wales, Victoria, and Queensland. The Mansfield beds of Victoria (regarded as Lower Carboniferous) contain *Lepidodendron australe* and fish—*Gyracanthides, Acanthodes, Strepsodus, Elonichthys,* etc. These beds may prove to be in part Upper Devonian. In New South Wales marine and freshwater Carboniferous beds occur. The marine fauna is of the Mountain Limestone type, and consists mostly of cosmopolitan types of brachiopoda, *Productus semireticulatus, Schizophoria resupinata, Leptaena analoga, Spirifera striata, Phillipsia, Griffithides,* and *Brachymetopus.* The coral fauna is typical—*Zaphrentis, Cyathophyllum, Lithostrotion, Aphrophyllum, Michelinia,* etc. *Mesoblastus* and *Tricoelocrinus* occur in Queensland. The freshwater beds have a Middle Carboniferous facies, with *Anthracomites ovata, Cardiopteris, Pitys,* and *Lepidodendron veltheimianum.* In Queensland the Star beds, well developed round Rockhampton, have a fauna very similar to that of the New South Wales series. Doubtful Carboniferous beds containing *Lepidodendron* occur in Western Australia. In eastern Australia no Carboniferous species extend into the overlying Permo-Carboniferous, and there is usually a well-marked unconformity between the two systems. The closing phase of the Carboniferous in New South Wales is represented by the Kuttung series of freshwater glacial beds—tillites and varve rocks. Glacial conditions also continued in the succeeding Lower Marine series of the Permo-Carboniferous.

PERMO-CARBONIFEROUS.—Of the Australian palaeozoic faunas that which attracts most attention is the marine Permo-Carboniferous. The interest is due to the change which continued a glacial phase in existence (Kuttung) when sedimentation was beginning, and to the effect of land-barriers as hindering migration between the eastern and western Permo-Carboniferous shores. The eastern Permo-Carboniferous fauna exhibits the typical Australian facies, and contains the development of many purely Australian types. The two main divisions of the marine sediments—the Lower and Upper Marine series (separated in typical localities by a freshwater Phase—the Greta coal-measures) vary little in character in New South Wales, Queensland, and Tasmania.

The principal elements of the fauna are:—

Foraminifera.—*Nubecularia, Pelosina, Hyperammina, Haplophragmium, Lituola, Endothyra, Lagena, Nodosaria, Geinitzina,* etc. *Nubecularia* is in great abundance, and the arenaceous and sub-arenaceous types preponderate. Horizons occur in both Lower and Upper Marines; in association with the Pokolbin (Lower Marine) horizon Wollong (Upper Marine) horizon are glacial beds, indicating the cooling of the water.

Spongida.—Sponges are rare; the anchoring spicules of *Hyalostelia, Lasiocladia,* and certain burrowing sponges (*Clionolithus*) are found in the Lower and Upper Marines of New South Wales.

Coelenterata.—One of the noticeable features of the Permo-Carboniferous of eastern Australia is the impoverished Coelenterata fauna, due without doubt to glacial conditions at the initiation of sedimentation. A few species of zaphrentoid corals, close to Hinde's genus *Plerophyllum,* show an extravagant development of stereoplasma. The tabulate *Trachypora* forms a well-marked zone-fossil in the Upper Marines.

Echinodermata.—This phyllum is of particular interest. Blastoids are represented by *Tricoelocrinus,* and the Crinoidea by the giant *Phialocrinus princeps* of the Upper Marines, 4½ inches in diameter. *Tribrachiocrinus* (a dicyclic form with large radianal and 'X' plate, three double brachia and two single) is peculiar to eastern Australia. A large *Archaeocidaris* and several species of palasterids (*Etheridgeaster, Monaster,* and *Palaeaester*) occur in the Lower Marines—one (*Etheridgeaster giganteus*) has a span of 7 inches.

Bryozoa.—The great development of the trepostomatous *Stenopora* is a characteristic of this period in eastern Australia. The massive *S. crinita* forms irregular polyzoaria of from 1 to 2 feet in size. Dendroid and flabellate types are also common, and present many species as yet undescribed. The Fenestellidae are also well developed. *Fenestella* is rare, but such types as *Phyllopora, Polypora,* and *Protoretepora* are extremely abundant, and in some cases form distinct limestones in the Lower Marines. Fenestellidae are equally developed in the Lower and Upper Marines, and in all provinces.

Brachiopoda.—This may be regarded as a *Martiniopsis* fauna. This protean genus is extremely abundant in all suitable sediments. Associated with it are winged Spiriferae, all strongly ridged, *Spiriferina, Dielasma, Chonetes, Productus, Strophalosia, Aulosteges, Lingula,* and *Orbicula.* In Queensland, in the Bowen beds, we find also *Derbyia seuilis.* It must be noted, in contradistinction to the Permo-Carboniferous brachiopod fauna of Western Australia and the Northern Territory, that Carboniferous species are entirely absent, also the Orthidae and *Leptaena* group, *Athyris, Cyrtina, Syringothyris,* and *Reticularia.*

Pelecypoda.—In this group of Mollusca what may be termed the Pacific facies of the Australian Permo-Carboniferous asserts itself, with purely endemic genera such as *Cleobis, Maeonia, Astartila, Pachydomus, Notomya, Aphanaia, Merismopteria, Clarkia, Deltopecten*—a giant form, a transition between *Aviculopecten* and *Pecten*—and *Stutchburia,* an edentulous variant of *Pleurophorus. Chaenonomya* of the Nebraska-Permian is very characteristic of certain estuarine deposits. The most interesting type is *Eurydesma,* mainly characteristic of the Lower Marines, noteworthy for its absence from Western Australia and its presence in the olive shales of the Himalayas and the Marine Karoo of German West Africa. The fauna is noteworthy for the preponderance of edentulous gaping types.. Cosmopolitan genera, such as *Nuculana, Scaldia, Solecurtus, Aviculopecten, Solenopsis, Modiolopsis* also occur. The fauna is evenly distributed along the east coast.

Gasteropoda.—There is nothing distinctive in the eastern gasteropod fauna, which includes *Platyschisma, Straparollus,* and various pleurotomarioids—*Keeneia, Ptychomphalina, Mourlonia,* and a naticoid type, together with a patelloid genus and *Orthonychia.*

Pteropoda and Conularidae.—*Hyolithes* is common, and a giant *Conularia,* reaching a length of 20 inches, occurs in the eastern provinces.

Cephalopoda are uncommon, but *Orthoceras* and *Agathiceras* (*Goniatites*) are abundant in the Ravensfield sandstone of New South Wales.

Crustacea.—*Leaia* and *Estheria* occur in the Newcastle coal-measures.

In Western Australia it has been customary to class certain formations as Carboniferous and certain as Permo-Carboniferous; but there is good reason to believe that the entire series, developed in the Irwin, Gascoyne, Mingenew, Minilya, Lyons River, and Kimberley districts is more properly Permo-Carboniferous as regards the mingling of the faunas.

One of the prominent features of the eastern Permo-Carboniferous fauna is the absolute absence of any Carboniferous species, whereas in the west (besides Indian species and local varieties) there are Carboniferous types such as *Schizophoria resupinata, Rhipidomella, Productus semireticulatus, Leptaena analoga, Phillipsia,* etc. These forms in eastern Australia are confined to the Star beds of Queensland and New South Wales, beds separated from the Permo-Carboniferous of that region by a well-marked unconformity. A most remarkable horizon of sandstones containing *Gastrioceras* is well developed in the Gascoyne area. Taking into consideration

the fact that the so-called Permo-Carboniferous sedimentation of both eastern and western Australia was initiated by glacial stages which must be regarded as synchronous, this mingling of faunas in Western Australia points to a direct communication with the Permo-Carboniferous coast-line of the Himalayan and Salt Range region. The fact that certain Producti, Pectinidae, Terebratulidae, and Spiriferidae of the West have a close resemblance to eastern Australian types may, perhaps, be regarded as betokening parallel development, rather than of specific identity. The Permo-Carboniferous of the Northern Territory has western affinities.

As regards the flora of the Permo-Carboniferous, a Lower Gondwana flora is preserved in both western and eastern Australia. The earlier beds are characterized by gangamopteroid types, the upper by *Glossopteris* and more especially by *Phyllotheca*.

MESOZOIC.—These rocks, freshwater and marine, range from Trias to Cretaceous. In all the States the freshwater beds are of Trias and Jurassic age. There is good reason to regard the so-called Jurassic (Ipswich) system as being the freshwater series directly succeeded by the marine Cretaceous. In Western Australia freshwater beds of Jurassic age occur at Mingenew with *Otozamites* and *Plagiophyllum*; at Champion Bay *Belemnites, Dorsetensia, Stephanoceras, Trigonia,* etc., occur; at the Greenough River are oolites yielding *Alectryonia marshii, Ctenostreon pectiniformis, Radula duplicata, Trigonia,* etc. It is possible that the Gingin chalk is of Cretaceous age. The fauna of the marine Mesozoic of Western Australia exhibit marked affinities with European and Asiatic species. At Point Charles in the Northern Territory, there is evidence of an abundant Cretaceous fauna—*Aucella, Scaphites, Histrichoceras,* etc., dwarfed forms with (in almost every case) Gault affinities.

Almost as marked as the difference between the eastern and western Permo-Carboniferous fauna is the lack of community between the marine Mesozoic fauna of the east and that of the west. Stratigraphical evidence indicates a continuity of sedimentation from, at latest, Jurassic to the end of Cretaceous time, and this has led to an apparent mingling of faunas. The Cretaceous Mediterranean—which occupied portions of Queensland, New South Wales, and South Australia—is characterized by numerous species peculiar to the region and many endemic genera among the Mollusca. The most typical forms are *Maccoyella, Pseudavicula,* and *Fissilunula,* all endemic types occurring in both Lower and Upper Cretaceous. The cephalopodan fauna is not large, but is noteworthy for the great size of the *Crioceras* and *Ancyloceras* group. *Ichthyosaurus, Plesiosaurus,* and *Cimoliosaurus* are represented by several species. The barrier which prevented the mingling of the eastern and western Permo-Carboniferous faunas seems to have persisted into late Mesozoic time.

The Mesozoic flora of eastern Australia may be divided into three groups—(1) the Ipswich-Walloon flora of Queensland, the Clarence basin of New South Wales, the South Gippsland basin of Victoria, and the Lake Eyre basin of South Australia; (2) that of the Tasmanian upper coal-measures; (3) the Hawkesbury series west of Sydney. The Ipswich beds show the cosmopolitan Trias-Jurassic vegetation with *Cladophebis denticulata,* various species of *Thinnfeldia, Taeniopteris daintreei, Podozamites, Baiera,* etc. They occupy the lower portion of the great artesian basin, and are succeeded conformably by marine Cretaceous shales and sandstones. The rather scanty evidence at present available indicates that the sagging of the Mediterranean region was associated in its early stages with lacustrine conditions, leading up to an invasion of the sea and marine sedimentation. These conditions on the coastal district ceased at the close of freshwater sedimentation, except in the Maryborough district of Queensland, where both freshwater and marine sedimentation took place. An abundant insect fauna, described by Tillyard from the Wianamatta and Ipswich series, contains many new species of Coleoptera, Hemiptera, Homoptera, and Orthoptera, associated in the Wianamatta shales with an isopod crustacean, *Phreatoicus.*

The upper coal-measures of Tasmania may be correlated with the Gippsland measures of Jurassic age. *Taeniopteris daintreei* is wanting, but *Cladophebis denticulata* is abundant, with *Thinnfeldia, Phyllotheca,* etc.

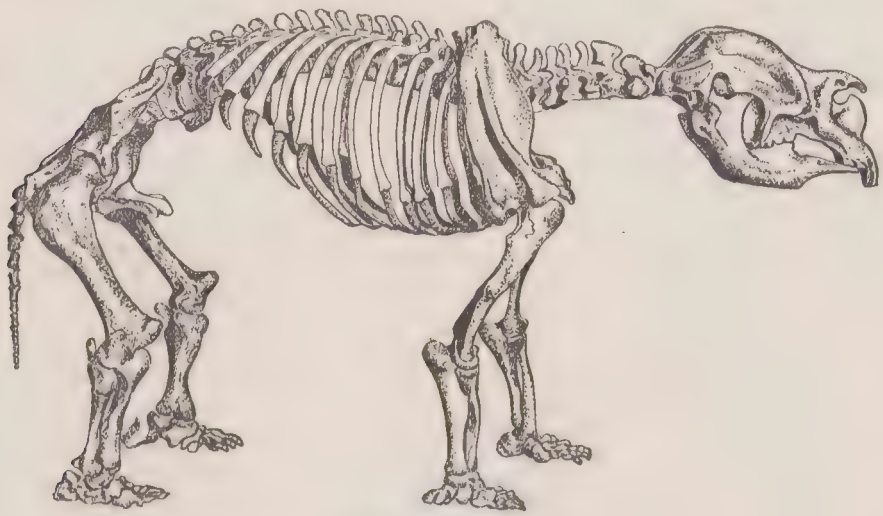
The Hawkesbury series is made up of the Narrabeen, Hawkesbury, and Wianamatta stages. The Narrabeen shales directly succeed the upper coal-measures (Permo-Carboniferous) with no break in sedimentation, and there is a mingling of the *Glossopteris* and Lower Mesozoic flora—*Glossopteris* (plate xxxiii, fig. 2) and *Schizoneura.* The Narrabeen, Hawkesbury, and Wianamatta stages have a well-developed flora with *Thinnfeldia odontopteroides* (in several varieties), *Macrotaenopteris, Alethopteris,* conifers, and *Phyllotheca*; the differences from the Ipswich flora are possibly due to more arid conditions. The Hawkesbury sandstones and Wianamatta shales have a well-developed fish-fauna (*Cleithrolepis, Gosfordia, Semionotus, Dictyopyge, Belonorhynchus,* etc.), together with labyrinthodonts—*Platyceps, Bothriceps* (shown on plate xxxiii, fig. 1), *Mastodonsaurus*—in part of Palaeozoic and of Rhaetic affinities. A depauperate foraminiferal horizon occurs in the Wianamatta shales. It is usual to regard these beds as in part of Triassic age, possibly slightly older than the Ipswich. At Talbragar in New South Wales beds with *Taeniopteris daintreei* (plate xxxiv, fig. 4), *Podozamites, Palissya,* and *Alethopteris,* contain a distinctive fish-fauna—*Leptolepis, Coccolepis, Aphnelepis,* etc.

CAINOZOIC.—The marine fauna is remarkable for the great development of sediments, and for the intense variation, ranging from Balcombian to Pleistocene and characterized by faunal characters dependent on changing water-temperature and bathymetric conditions. The Balcombian series affords evidence in many cases of a fairly deep water-deposition; the overlying Janjukian is a shallower series, characterized by foraminiferal limestones of an Upper Miocene type. *Turritella* limestones are well developed in South Australia, and at Table Cape—where the oldest Australian marsupial (*Wynyardia bassiana*) is found. The newer Kalimnan and Werrikooian series show in their molluscan content an approach to the Pleistocene, which in Australia is distinguished by its terrestrial and lacustrine deposits and by its fauna and flora.

TERTIARY.—Terrestrial beds containing plant-remains are found in several States; the oldest series occurs in the deep leads, which may date back to late Eocene or early Miocene time. The vegetation of these deposits in eastern Australia bears considerable resemblance to that of the modern 'brushes,' and affords evidence of more humid conditions. In late Tertiary and Pleistocene time the inland plains supported a giant

marsupial fauna—*Diprotodon, Nototherium,* members of the Phascolomidae, *Thylacoleo,* Macropodidae, and monotremes such as *Proechidna* and *Ornithorhynchus* together with ratite birds (*Dromornis, Genyornis,* etc.), reptiles, and chelonia—*Megalania, Crocodilus, Meiolania,* etc. The giant members of this fauna have been found in all the States, but are most abundant in the great central plains of Queensland, New South Wales, and South Australia, where their remains occur in old lake-basins, mud-springs, and river-beds. Their destruction was due to a great diminution of rainfall which took place in late Pleistocene time.

In 1926 about four hundredweight of fossil bones were found in Jurassic (Lower Walloon) deposits on Durham Downs station near Roma in Queensland; they comprised caudal vertebrae, fragments of long bones from a hind-limb, and shattered portions of the pelvic girdle. From these H. A. Longman reconstituted a giant herbivorous dinosaur, *Rhoetosaurus brownei* (Rhoetus was a mythological Greek giant, and Durham Downs is owned by A. J. Browne). The anterior caudal vertebrae of this monster are 18 inches high, about 6 inches long, and weigh 30 lb. each; the fragment of the femur-shaft is 28 inches round, and the complete bone



Diprotodon australis.

must have been over 5 feet long; the tail—of which 16 consecutive vertebrae are preserved—tapers rapidly, and the manner in which adjoining vertebrae are connected presents features not apparent in other dinosaurs. The enlarged neural canal ('tail-brain') is well marked. *Rhoetosaurus* belongs to the family Camarasauridae in the sauropod group of herbivorous dinosaurs; its length was probably 40 feet. The bones are in the Queensland Museum. W.S.D.

Fossil Marsupials.—The fossil remains of mammals hitherto discovered in Australia do not carry the history of this group very far back in geological time. Whereas in Europe and America remains of mammals—chiefly jaws and teeth of small, long-extinct monotremes, marsupials, and insectivores—are found in deposits of Jurassic and even Triassic and Cretaceous age, in Australia no such remains have been discovered in coeval deposits. The earliest Australian fossil mammal, *Wynyardia,* was found in Tertiary strata. It belongs to none of the recognized marsupial groups, and probably represents a generalized group which flourished in Tasmania before the diprotodont and polyprotodont types became differentiated.

To the much later Pleistocene belongs an abundant marsupial and monotreme fauna, remains of which have been found in river and lake deposits in all the States, more especially on the inland plains. This fauna comprises specimens nearly related to existing forms, others of extinct types, and many much larger than any at present in existence. Among these is *Diprotodon,* which appears to have been intermediate in structure between the phalangers and the kangaroos, and was as large as a rhinoceros. *Nototherium,* another extinct form of large size, seems to connect *Diprotodon* with the wombats on the one hand and the phalangers on the other. *Thylacoleo carnifex* (Pouched Lion) is the only representative of the family Thylacoleontidae. The living animal was about as large as a leopard, and—though its habits are still under discussion—was almost certainly carnivorous, feeding on the herbivorous marsupials of its time; many tooth-marked bones of such marsupials have been found in association with *Thylacoleo* remains. The complete skull of a large specimen is 10 inches long and more than 8 inches wide. The dentition consists mainly of a large canine-like incisor and an elongated and specialized pre-molar on each side of both jaws; the pre-molars (carnassials) have a sharp oblique cutting-edge, and those of the upper jaw are about 2 inches from front to back. The other teeth are mostly small, and were apparently of little use (see plate xxxiv, fig. 1). Isolated teeth were figured in Sir Thomas Mitchell's *Three Expeditions into the Interior of Eastern Australia* from specimens found by him in the Wellington caves; the fossil was subsequently named by Richard Owen from additional material. Its nearest relatives belong to the Phalangeridae, so that *Thylacoleo* represents a formerly herbivorous marsupial which acquired carnivorous habits and a special-

ized dentition. This Pleistocene fauna also included members of existing genera, some of huge size, others not larger than their congeners of the present day. The recent discovery of *Nototherium* in Tasmania indicates that during the Pleistocene period Tasmania had not yet lost, or had temporarily re-established, land-connection with the mainland.

On the mainland, but not in Tasmania, remains of the dingo are found alongside *Diprotodon* and other extinct marsupials; the advent, therefore, of this non-marsupial mammal must have taken place at a very early period—perhaps even before the earliest human beings found their way into the Australian region.

Recent discoveries.—Besides the dinosaur mentioned above, Australian fossil beds have recently yielded a new reptile and a distinctly bizarre marsupial, a member of the *Nototherium* group known as *Euryzygoma dunense*. The genus was established by H. A. Longman in 1921 from a skull found at a depth of 70 feet in a well at Brigalow on the Darling Downs. The skull is more than 2 feet long and, owing to the extraordinary development of the cheek-bones (inferolateral processes of the zygomata), 2 ft. 2 in. wide. *Euryzygoma* shows affinities with *Phascolarctus* (koala), *Phascolomys* (wombats), and *Macropus* (kangaroos), but is evidently a very specialized type; it was at least as big as a bullock, and its molar teeth demonstrate its herbivorous habits. The extraordinary cheek-processes were probably associated with cheek-pouches such as are found to-day on a small scale in wombats and koalas.

The reptile *Kronosaurus queenslandicus*, was found in Cretaceous deposits at Hughenden in Queensland, and described in 1924 by H. A. Longman from a fragment of a lower jaw containing the remains of six teeth. It is allied to the giant pliosaurs of Europe, which have a relatively large head and a short neck; its paddle-shaped limbs show that it was a powerful swimmer. As its teeth were nearly 10 inches in length and 1½ inches in maximum diameter, it was probably one of the giants of the Pliosauridae.

W.A.H.

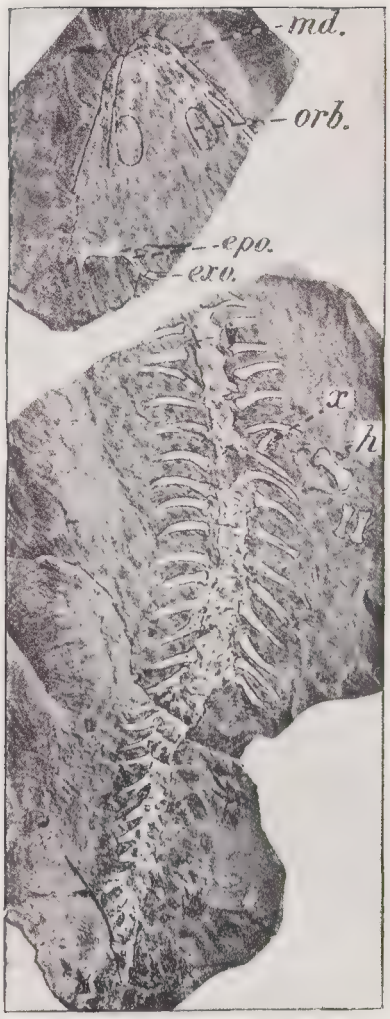
Fossil Insects.—The record of the class Insecta, as preserved in its fossils, comprises winged forms (Pterygota) only. The wingless forms (Apterygota), comprising the orders Thysanura (silverfish, bristle-tails) and Collembola (spring-tails), are assuredly the most ancient of existing insects, but these delicate creatures have left no fossil record, and we do not know at what geological epoch they first appeared upon the earth. As the skeleton of an insect is almost entirely external, and composed of a non-cellular substance (chitin) which is very resistant to acids and alkalies but dissolves slowly in water, it is seldom that the actual substance of the skeleton is preserved. Usually the chitin is changed through chemical action, or is completely dissolved away, leaving only an impression of the insect on the rock within which it has become enclosed. Further, most insect-fossils consist of wings alone; the chitin of these is harder and more resistant than that of the body, and is not exposed to decay from the proximity of the internal organs.

The earliest-known fossil insects are found in the Upper Carboniferous of North America. They consist entirely of Palaeodictyoptera, an order of large insects whose wings show not only the ordinary main veins, but also a more or less dense meshwork of irregular venation between them. At a somewhat later horizon in the Upper Carboniferous, at Commentry in France, the Blattoidea (cockroaches) form about 94 per cent of the insect fauna. In the Lower Permian of the northern hemisphere the Palaeodictyoptera have disappeared, but the cockroaches continue dominant; thenceforward the percentage of cockroaches declines rapidly, until in Tertiary strata they number less than one per cent of the total. All the fossil insects described from Palaeozoic strata in the northern hemisphere are Hemimetabola—they have not succeeded in developing a true resting (pupal) stage. Between the Permian and the Lias there is a great gap; the Lias shows insects much more like those of the present day, with 59 per cent of Holometabola (insects with a true pupal stage) and only 41 of Hemimetabola. In Tertiary strata Holometabola account for 81 per cent of the total, and at the present day for 87 per cent.

Belmont and Ipswich Beds.—Two Australian beds fill the gap between the Permian and the Lias—those of Belmont and Newcastle in New South Wales, which lie close to the top of the Permian, and the Ipswich beds in Queensland, which lie in the Upper Trias. Only ten specimens have so far been obtained from the former; the latter have yielded more than 200 specimens already, and promise to become one of the most important fossil insect-beds yet discovered.

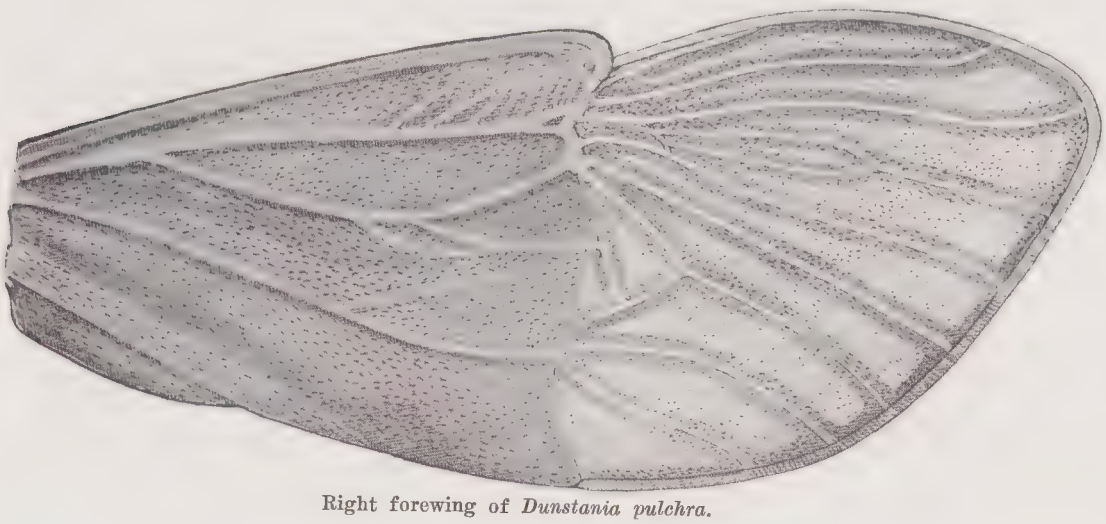
Insects from the Belmont and Newcastle beds have been found either in the *Glossopteris* shales, just above the 'dirty seam' in the cliffs at Newcastle, or at a somewhat higher horizon in a cherty shale uncovered in a small quarry near Belmont. They consist only of Psocoptera, Homoptera, Mecoptera, and an allied order Paramecoptera. Homoptera are represented by the genera *Permoscarta* and *Permofulgor*, both of them allied to present-day Cercopidae and Jassidae, but not referable with certainty to any given family. The peculiar genus *Lophioneura* is probably ancestral to the present-day Psocoptera. The scorpion-flies (Mecoptera) are represented by the fore- and hind-wings of a fine choristid genus, *Permochorista mitchelli*. Closely allied to this is the genus *Mesochorista* from the Trias of Ipswich; and the direct descendants of these fossil forms are still extant, showing little change, in the genus *Taeniochorista* and its allies of the present day. The finest discovery at Belmont is the fossil *Belmontia mitchelli*. This has been placed in a new order, Paramecoptera, and is undoubtedly an ancient form collaterally related to the true scorpion-flies, and directly ancestral to the Trichoptera and Lepidoptera. All the above fossils were discovered by John Mitchell of the Newcastle technical college, and described by R. J. Tillyard.

The first discovery of fossils at Ipswich was made by T. H. Simmonds of Brisbane, and the collection was dealt with in a paper by Etheridge and Olliff in 1890. The fossils found were chiefly the elytra of beetles. Later on, B. Dunstan, the Queensland government geologist, explored these beds more systematically, and Tillyard described the insects obtained by him. The horizon of the beds was for a long time in doubt, but the researches of Walkom on the flora and Tillyard on the insects agree in placing them in the Upper Triassic, 'either Rhaetic, or a little older.' The insect fauna is remarkably rich, including a distinct remnant of specialized offshoots of the old Carboniferous fauna of the northern hemisphere; there are representatives of the extinct orders Protorthoptera (*Mesoman-*

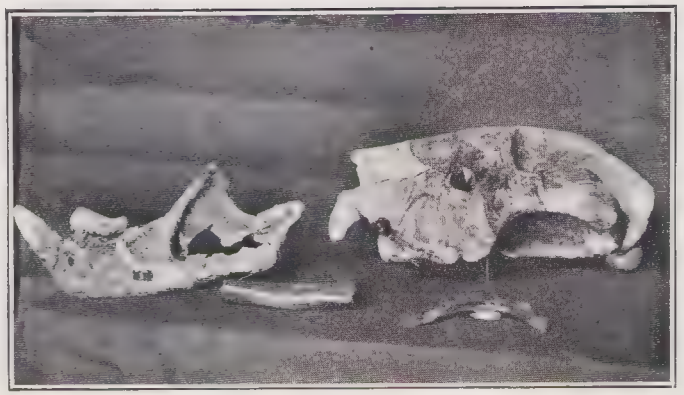


Bothriceps major.
Permo-Carboniferous amphibian.

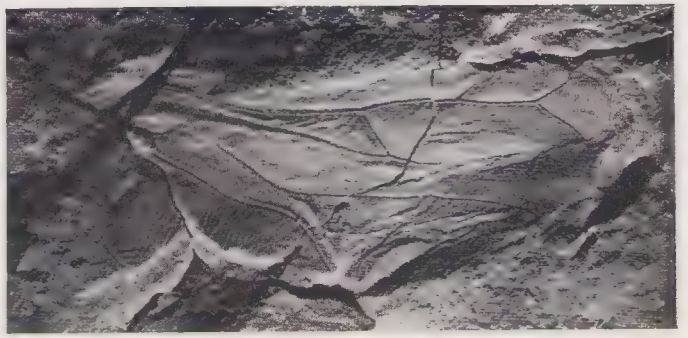
Permo-Carboniferous Plants.
1-2. *Glossopteris linearis*; 3-4. *Glossopteris Browniana.*



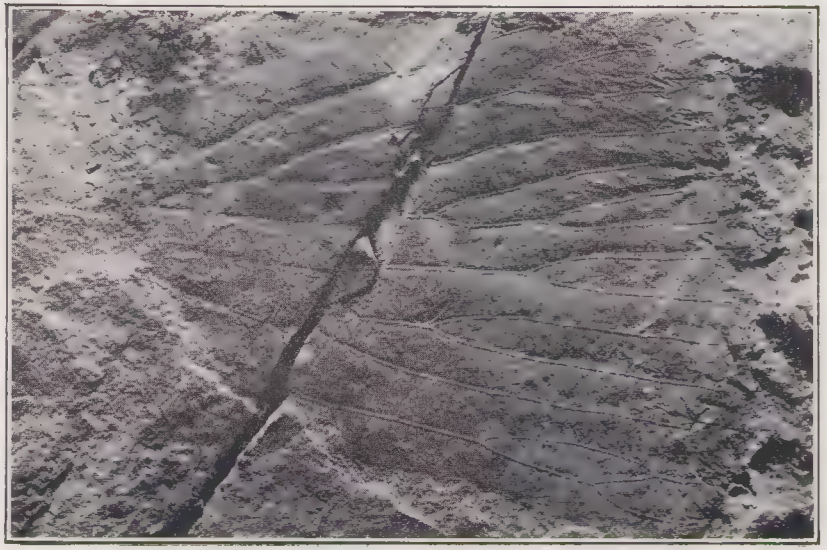
Right forewing of *Dunstania pulchra.*



1. Jaws of Marsupial Lion.



2. Fossil wing of *Ipsvicia jonesi.*

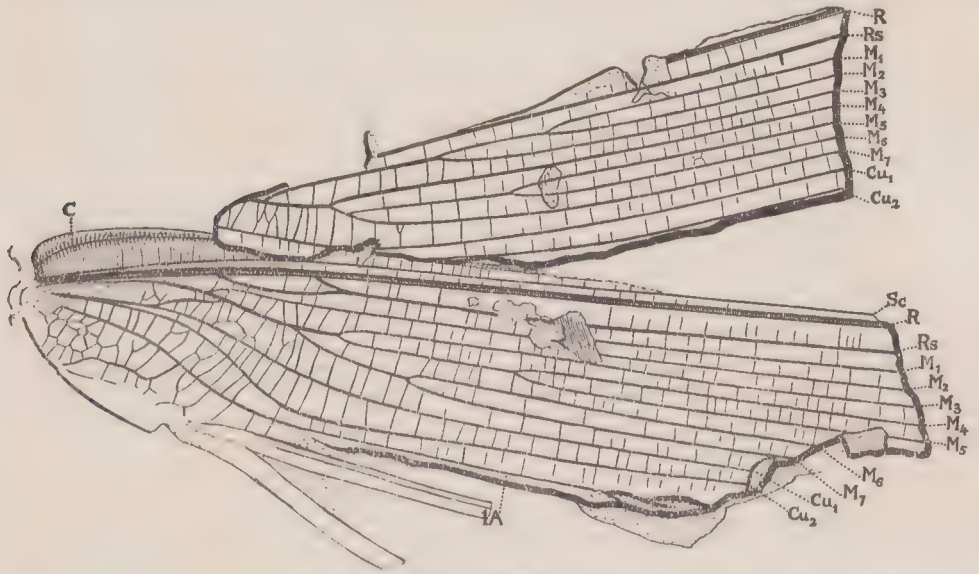


3. *Archipanorpa (?) bairdae,* n.sp.

Slab of shale from Talbragar, N.S.W., with fossil plants and fish.
(A) *Taeniopteris daintreei*; (B) *Thinnfeldia odontopteroides*; (C) *Podozamites lanceolatus*; (D) *Coccolepis* (?), a fossil fish.

tidion, Mesorthopteron) and Protodonata, the latter being represented by the extraordinary *Aëroplana mirabilis*. A very archaic genus of cockroaches, *Austromylacrites*, is also a member of a Carboniferous family.

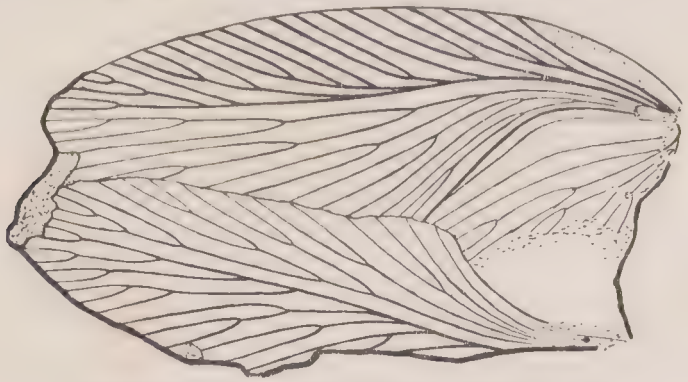
The cockroaches (Blattoidea proper) are represented by a number of species—about 11 per cent of the total—placed in three new genera (*Triassoblatta, Samaroblatta*, and *Austroblattula*) of the family Mesoblattinidae. The most



Aëroplana mirabilis (x 5).

complete of these is *Triassoblatta typica*. The true dragonflies (Odonata) are represented by three genera, *Mesophlebia, Triassolestes*, and *Perissophlebia*, all peculiar to Ipswich. They are the oldest-known true dragon-flies, but appear to have reached a fairly high stage of evolution; *Triassolestes* is in some respects intermediate between the existing Japanese genus *Epiophlebia* and the true Lestinae.

Homoptera represent 19 per cent of the total; all belong to the division Auchenorrhyncha, and are mostly archaic jassids or cercopids. A new



Triassoblatta typica (left and right tegmina, x 7½).

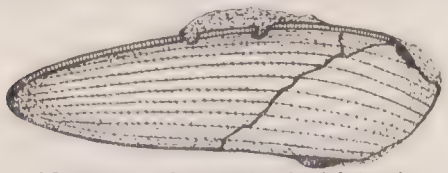
family Ipsviciidae, evidently an early offshoot of the Scytinopteridae, is represented by three fine specimens of the genus *Ipsvicia*; that of *I. jonesi* (plate xxxiv, fig. 2) is an absolutely complete tegmen, with the sculpture beautifully preserved. The genus *Mesojassus* differs little from *Jassus* and its allies of the present day. The earliest-known true Hemiptera are represented by a family of large bugs, Dunstaniidae, containing three genera and species. The finest of these is *Dunstania pulchra* (plate xxxiii, fig. 3). Among the Holometabola the most interesting are representatives of two new orders allied to the true scorpion-flies (Mecoptera). One of these is Protomecoptera, represented by *Archipanorpa* (plate xxxiv, fig. 3), the preservation of which is so fine that the sockets of the hairs and bristles on the wing-veins are perfectly visible; the other is Paratrichoptera, represented by four genera of caddis-like wings, which have been shown to be intermediate between Mecoptera and Diptera. The finest of these is *Aristopsyche superba*. The order may well be directly ancestral to the true Diptera, which first appear in the Lias. True scorpion-flies (Mecoptera) are represented by *Mesochorista*, already referred to above, and by the peculiar genus *Stereochorista*. The lacewings (Planipennia) are represented by two genera of Prohemerobiidae. One of these, *Archepsychops*, is clearly the direct ancestor of the existing genus *Megapsychops*—which, curiously

enough, is only known to occur on Mount Tambourine, a few miles south of the Ipswich beds.

Beetles comprise no less than 46 per cent of the total; most are represented by well-preserved elytra, the dominant genus being *Ademosyne* with about 20 species—probably water-beetles of the family Hydrophilidae. Other families which were probably represented were the Elateridae, Buprestidae, Malacodermatidae, and Cerambycidae, perhaps also the Carabidae and Tenebrionidae; but it is not usually possible to ascertain definitely the family to which even a perfectly preserved elytron belongs.

Other Insect Fossils.—In passage-beds between Palaeozoic and Mesozoic, in the roof of the coal-seam of the Sydney harbour colliery at Balmain, W. S. Dun discovered the impression of a small insect-wing, which has been described under the name *Elcanopsis sydneiensis*. It is the earliest-known record of a true locust (Orthoptera) belonging to the family Elcanidae, abundant in Liassic and Upper Jurassic strata in the northern hemisphere. Insects have also been found in brick-pits at St. Peter's, near Sydney, the horizon being Upper Triassic (Wianamatta shales); most are beetles, but there are also specimens of a fine genus, *Notoblattites*, belonging to the Protorthoptera, and resembling a large cockroach. The poorly preserved remains of a huge insect, *Mesotitan*, probably belonging to the same order, were also found. The fauna of these pits suggests a slightly older horizon than that of Ipswich.

Higher up in the Wianamatta shales at Glenlee near Camden two other species of *Notoblattites* have been found, together with an interesting Paratrichopteron and a Homopteron. At



Ademosyne wianamattensis (elytron).

the very top of the same beds, at Narellan, a single elytron of a species of *Ademosyne*, beautifully preserved, was discovered in mudstone. This horizon is possibly homotaxial with the Ipswich beds.

In the Jurassic beds at Talbragar, New South Wales, a single insect has been found. It was described by Etheridge and Olliff under the name *Cicada lowei*, but is certainly not a cicada, and Handlirsch changed its name to *Griphologus lowei*. It is probably a fairly large Dipteron.

In a marine bed of Cretaceous age near the Flinders River in Queensland a fragment of a fine dragonfly wing was found by R. L. Jack, and described by Woodward in 1884 under the name *Aeschna flindersiensis*. It belongs, however, to the family Aeschnidiidae, only otherwise known from the Jurassic of Europe, and Tillyard has placed it in a new genus *Aeschnidiopsis*.

The Tertiary insect fossils so far discovered are very few. Larvae of ephemerids and Diptera have been found at Vegetable Creek in New South Wales; a fine lacewing (*Euporismites balli*) near Goodna in Queensland; and some fossil dragonfly larvae belonging to the Lestidae in the core of the Duaringa bore in Queensland.

R.J.T.

See R. Owen's *On the Fossil Mammals of Australia* (London, 1876) and *Fossil Remains of Extinct Mammals of Australia* (London, 1877); Lydekker's *Catalogue of Fossil Mammals in the British Museum* (part v, 1887) and *Marsupialia and Monotremata* (1894); A. S. Woodward's *Vertebrate Palaeontology* (1898); Tillyard's *Insects of Australia and New Zealand* (1926).

Palmer, Sir Arthur Hunter (1819-1898), born at Armagh in Ireland on 28 December 1819, and educated at Youghal, in 1838 migrated to New South Wales and for 23 years was employed by Henry Dangar on various stations, ultimately becoming general manager of the Dangar properties. In 1861 he left this work and established himself in Queensland, entering politics in 1866 as member for Port Curtis, and joining the Mackenzie ministry as colonial secretary and secretary for public works in 1867. On the defeat of this ministry he went into opposition for 18 months, and then, displacing Charles Lilley, formed one of his own, which lasted from 3 May 1870 to 8 January 1874—the first stable government formed in Queensland; but his term of office is chiefly notable because during it S. W. Griffith came to the front as a private member. Palmer's next appearance as a minister was under Thomas McIlwraith, whose colonial secretary he was from 21 January 1879 to 24 December 1881. By this time he had wearied of active politics, and gladly retired to the presidency of the legislative council, which he held till his death on 19 March 1898.

Palmer is described by contemporaries as a politician of little education but much sound sense, inclined to bully fellow-members (a remanet, it was said, from his bullock-driving days), but popular nevertheless. He left little mark on the legislation of the colony, though his introduction in 1870 of a bill to give northern Queensland a separate financial existence shows a certain radicalism of temperament. While president of the council he five times administered the government during interregnum (see Governors); he was a trustee of the Queensland Museum, and honorary colonel in the local volunteer forces. (K.C.M.G., 1881.)

Palmer, Sir James Frederick (1804-1871), born in 1804 at Great Torrington in Devonshire, and educated for the medical profession, after some years' practice in London migrated to Melbourne; there he gradually abandoned medicine for the manufacture of cordials, and finally for the business of a wine and spirits merchant. As mayor of Melbourne in 1846 he laid the foundation-stone of the Melbourne Hospital. In September 1848 (after the sham election of Earl Grey for Melbourne) he was elected one of the five representatives of Port Phillip in the Sydney legislature, but vacated the seat in June 1849, and in 1851, being elected by Normanby to the first Victorian legislative council, was made speaker of that body. When in 1856 the colony obtained self-government, Palmer was elected to the upper house and became its president, holding the position until 1870. Apart from his interest in education—he was for a time chairman of the education commissioners—he was for the most part a sedate and dignified figurehead. Resigning his presidentship on 11 October 1870, he died on 23 April 1871. (Kt.Bach., 1857.)

Palmer, John (1760-1833), born in England in 1760, entered the navy when only eight years old, and during the war of the American revolution was for some time a prisoner of war. On 24 October 1786 he joined H.M.S. *Sirius* as purser, came in her to New South Wales, served until she was wrecked on Norfolk Island in 1790, and was on 12 April of that year made by

Phillip commissary-general of the colony. Grose during his lieutenant-governorship granted Palmer 100 acres on the shores of what is now Woolloomooloo Bay, and there he built in 1802 a house reckoned in those days exceptionally luxurious, which was afterwards successively inhabited by Archdeacon Scott and Archbishop Polding. Besides his public duties Palmer engaged in milling—King gave him a mill-site close to government house which annoyed Macquarie exceedingly—and in coastal trading. He owned in 1804 two 30-ton vessels which voyaged as far as Bass Strait, and a third smaller vessel which did not venture farther than the Hawkesbury. He also owned farms purchased from other settlers (nearly 3000 acres in 1807), on which he bred cattle and sheep and grew some wheat. During the mutiny against Bligh he sided with the governor and was imprisoned by the Johnston-Macarthur party, but on Macquarie's arrival was reinstated in his office until 31 March 1810, when he was relieved from duty to proceed to England as a witness for Bligh. During his absence in England Macquarie reorganized the department, and he returned on 6 May 1814 to find himself merely an assistant-commissary-general, and that only because his knowledge would be useful in recovering debts due to the government from pre-Macquarie days. Macquarie, however, became dissatisfied with the whole department, and on 24 January 1819 a fresh reorganization involved the retirement of Palmer on half-pay. By this time he had in one way and another lost all his estates except 100 acres at Parramatta and 1500 acres at Hambledon, near Rouse Hill, which had been granted him in 1818 as compensation when Macquarie resumed his land on the Hawkesbury for a township (Pitt Town). After his retirement Palmer settled down on his farm at Parramatta, was made a magistrate by Brisbane, and became one of the Marsden-Blaxland-Macarthur circle; this led to his dismissal from the bench through a quarrel between one of Brisbane's protégés and the circle, but he was restored to it in 1825 just before Brisbane left the colony. The rest of his life seems to have been peaceful. He died at Parramatta on 27 September 1833, having survived all his fellow-officers of the First Fleet.

Palmer, THOMAS FYSHE (1747-1802), born at Jekwell in Bedfordshire in July 1747, was educated at Eton and Queen's College, Cambridge (B.A., 1769; M.A., 1772; B.D., 1781). In 1781 he gained a fellowship and was made curate of Leatherhead in Surrey, where he met Dr. Johnson and Boswell. About this time he was greatly influenced by the writings of Dr. Joseph Priestley of Birmingham, an advocate of progressive Unitarianism; he renounced his orders, and on 14 July 1783 offered his services as preacher to the Unitarian Society founded by William Christie at Montrose in Scotland. Here he worked from November 1783 to May 1785, then moved to Dundee, where he founded the Unitarian Church which still exists there. He preached frequently at Edinburgh, Glasgow, Arbroath, and Forfar, and founded societies in all these places. By 1792 his sermons had attracted much public attention. In the same year Dundee became a centre of the widespread agitation for political reform, and in 1793 a society (drawn for the most part from the artisan class) was formed and named the 'Friends of Liberty.' Palmer was soon drawn in, and among other work for the society edited a handbill which complained of the extravagant taxation necessitated by a fruitless war and demanded universal suffrage and short parliaments. This was printed at Edinburgh in July 1793, and hundreds of copies were circulated. The government took it very seriously. On 2 August Palmer was arrested on a charge of sedition, and was tried at Perth on 12 September. Both trial-judges summed up against him, the jury held the charge proven, and he was sentenced to seven years' transportation. The conviction, following upon that of Thomas Muir (q.v.), raised a storm of indignation among opponents of the government, and repeated attempts were made during the early part of 1794, by earls Lauderdale and Stanhope in the house of lords and Fox and Sheridan in the commons, to have the sentence reversed.

Palmer, after confinement in the Tolbooth, was sent with Muir to the hulk *Stanislaus* at Woolwich; at first he was put in irons, and placed among the worst felons, but after a month was treated more leniently. On 11 February he, Muir, and William Skirving were sent on board the *Surprize* with a party of convicts bound for Botany Bay; this premature embarkation was intended to forestall further debate in parliament. The *Surprize* left England on 2 May 1794 and reached Port Jackson on 25 October; during the voyage Palmer and Skirving were accused of fomenting a mutiny, and were harshly treated by the vessel's master, but both charge and treatment were abandoned when they landed. Grose gave them houses on the eastern bank of the Tank Stream, and both he and Hunter allowed them as much freedom as was possible. Palmer bought a farm near Muir's on Gore Hill, where he found the soil 'capital, the climate delicious,' and was even stirred to wish 'that all the paupers of Great Britain could make interest to be sent here.' In April 1796, when Skirving was dead and Muir had escaped from the settlement, Palmer was living 'quiet and retired;' and so he continued till the end of his sentence, establishing (with the help of James Ellis, a friend who had voluntarily accompanied him from England) a precarious trade with Norfolk Island. In September 1800, when he was a free man again, he and Ellis bought a vessel in which to return to England, trading among the South Sea islands on the way. Fortune, however, was adverse; they spent six months on the New Zealand coast without securing any cargo, were hampered at Tonga by civil war in the group, were wrecked in the Fijis, and on their way to Macao in China were driven to the Ladrone group (better known as the Mariannes) and held there as prisoners of war by the Spanish governor, Spain being at war with England. Palmer, whose health had suffered greatly during the early part of his sentence, contracted dysentery and died on 2 June 1802. Two years later his body was exhumed, taken to America, and interred in the cemetery at Boston in Massachusetts. In 1844 a monument was erected in memory of Palmer and his companions in the Calton burying ground at Edinburgh.

Palmer's *Narrative of the Sufferings of T. F. Palmer and W. Skirving* was published at London in 1797. *The Trial of the Rev. Thomas Fyshe Palmer, before the Circuit Court of Justiciary . . . on an Indictment for Seditious Practices* was printed at Edinburgh for Skirving in October 1793, and published in Edinburgh, Glasgow, Dundee, Perth, and London. See MUIR, THOMAS.

J.V.C.-B.

Palms, the popular name of the large family Palmaceae, chiefly tropical in habitat; Queensland

may be considered their Australian home. The flowers have six rigid segments in two series (representing sepals and petals), arranged in spikes; sexes distinct in most species; fruit a drupe or berry. Most Australian palms belong to the tribe Arecaceae.

Archontophoenix Cunninghamiana, a tall species with feathery leaves, is the Bangalow Palm of eastern New South Wales, and the Piccabeen of Moreton Bay; its spathes are used by the aborigines for water-containers. *A. Alexandrae* and *A. Beatriceae* are more exclusively tropical. The allied *Ptychosperma elegans* figures erroneously in nurserymen's catalogues as *Seaforthia elegans*, the name given to it by Robert Brown (q.v.). *Drymophlaeus Normanbyi* is the Black Palm of northern Queensland, whose dark-coloured stems are manufactured into walking-sticks. The Walking-stick Palm, however, is *Linospadix* (*Bacularia*) *monostachya*, a slender, erect plant of 6-12 feet that occurs in northern

Clump of young Bangalow Palms, and fruit.

New South Wales and southern Queensland; two equally dainty species of *Bacularia*, *B. minor* and *B. Palmeriana*, occur in northern Queensland.

Of the tribe Corypheae a species of *Corypha* and one of *Licuala* are found in northern Queensland. *Livistona* comprises the cabbage-palms, with fan-shaped leaves. *L. australis* ranges from north-eastern Victoria into Queensland; *L. Mariae*, found in the Macdonnell Ranges and north-west to the Kimberley district of Western Australia, is one of the very few inland palms; *L. Muelleri* and *L. Benthami* are confined to tropical Queensland; *L. Alfredi* ranges from the Hammersley ranges to Kimberley, and *L. Eastoni* also occurs in the Kimberley district.

The tribe Lepidocaryeae includes the genus *Calamus*, weak-stemmed climbers known as 'lawyer-canes,' abundant in tropical Asia. *C. Muelleri*, found in the brush forests of northern New South Wales and Queensland, is armed with innumerable sharp spines and forms almost impenetrable thickets; four other species, all larger than the one just named, are confined to tropical

Livistona Australis, and flower.

Queensland—*C. caryoloides* (Ground Palm), *C. Moli*, *C. australis*, and *C. radicalis*.

The Date Palm (*Phoenix dactylifera*) and Coconut Palm (*Cocos nucifera*) are both exotics. The so-called Kentia palms (*Howea*), much cultivated in Australia and elsewhere, are endemic in Lord Howe Island (q.v.).

Pamphlett, THOMAS, born in England in 1789, migrated to New South Wales about 1819 and was employed as a timber-getter in the Illawarra district. On 21 March 1823 he and three others left Port Jackson in an open boat 29½ feet long with a 10-foot beam to ship cedar from Wollongong. When only eight miles short of their destination, a violent gale forced them to lower sail and run before the wind for five days, and for another six it was impossible to carry sail. Then, under the impression that they had been driven southwards, they steered roughly north-west by the sun for 10 days, nearing land at last on 13 April. That night the boat struck a reef, but was washed over it without damage; three days later the three survivors (one had died of thirst during the voyage) managed to land in a bight, whereupon another gale got up and the boat was stove in. Actually they were some five hundred miles north of Sydney, on an island in Moreton Bay since called Stradbroke Island; still under the impression that they were well south of Sydney, they tried to make their way north, and found the aborigines

on the whole friendly and helpful. Gradually they worked round the shores of the bay, being aided by blacks to cross a large river, and in the end settled down with a tribe whose main camp was near the mouth of the Pumicestone River at the northern end of the bay. Here on 29 November John Oxley, returning from a voyage to Port Curtis and wishing to examine Moreton Bay more carefully than Flinders had done, landed from the cutter *Mermaid* and discovered Pamphlett (the other two had gone off northwards); and, hearing from him of the big river not far south, Oxley entered it on 2 December and pushed his exploration about 50 miles inland, naming it the Brisbane River in honour of the then governor.

Oxley's official report makes no mention of Pamphlett or of the fact that the three castaways were the first discoverers. But John Uniacke, one of Oxley's party, took down from Pamphlett's lips the narrative of his adventures, and Barron Field in 1825 published it in a collection of geographical memoirs. Otherwise we should never have known who really discovered the Brisbane.

Pandanus. See SCREW PINE.

Panorpata. See SCORPION-FLIES.

Paper-making. See VEGETABLE PRODUCTS.

Papua, originally known as British New Guinea, is a Territory of the Australian Commonwealth in the south-eastern region of New Guinea, separated from the Australian mainland by Torres Straits, which at this point are less than 100 miles wide. The Territory comprises an area of 90,540 square miles—about a quarter of the whole island—of which 2754 square miles consist of groups of islands scattered along the coast. Its northern boundary, separating it from what used to be German New Guinea and is now known as the Mandated Territory of New Guinea (q.v.), runs from the eastern coast along the parallel of 8° S. lat. to the intersection of the 147th meridian, thence NW. to the intersection of 6° S. lat. with the 144th meridian, and then WNW. to the intersection of 5° S. lat. with the 141st meridian. This purely artificial boundary was devised to correspond roughly with the main watershed of the island. The western boundary, separating the Territory from Dutch New Guinea, coincides with the 141st meridian from the mouth of the Bensbach River to 5° S. lat., except where, between the 6th and 7th parallels, it follows a westerly bend of the Fly River. On the south the extra-territorial boundary of Queensland takes in the islands of Kawa, Adabadanakawa, Matakawa, Moimikussa, Boigu, Dauan, Kaumag, and Saibai, all lying from one to three miles off the Papuan coast.

Discovery and Exploration.—For discoveries before Cook's time, see AUSTRALIA, DISCOVERY OF. In 1793 Bampton and Alt, masters of vessels in the East India Company's service, explored the southern coast as far as the Gulf of Papua, and J. A. d'Entrecasteaux investigated the south-eastern districts. In 1842 Captain F. P. Blackwood in H.M.S. *Fly* surveyed a part of the Fly River estuary and the western side of the Gulf of Papua; at a later date Lieutenant Charles B. Yule in H.M.S. *Bramble* continued the survey to Redscar Bay. In 1849 Captain Owen Stanley in H.M.S. *Rattlesnake* examined the south-eastern end of the island, and in 1873 Captain John Moresby discovered Hall Sound and the harbour of Port Moresby, examined the north-eastern coast from East Cape to Astrolabe Bay, and settled the true shape of the island. Since that time most exploration work has been carried out by government officials; but L. Maria d'Albertis in 1875-7 discovered the Alice River (a tributary of the Fly 460 miles above its mouth), and in 1888 Everill surveyed and named the Strickland River, the main tributary of the Fly. In 1890 MacGregor journeyed 610 miles up the Fly and Palmer rivers, and several years later ascended Mount Victoria (13,121 feet). Other noteworthy expeditions are those of Monckton from the Waria to the Gulf of Papua in 1907, and Mackay and Little's exploration of the upper Purari River and Mount Murray a few years later. In 1910 Staniforth Smith (q.v.) in company with Bell and Pratt visited the upper Kikori district, for which feat he received the Royal Geographical Society's medal. In 1913 Massey-Baker discovered and named Lake Murray near the Strickland River, and Ryan trekked from the Kikori to the Bamu, being severely wounded by natives on his way; in 1914 Chinnery explored the Kunimaipa valley and the surrounding district behind Mount Yule, and Humphries walked from Karema on the Gulf of Papua to Morobe in the Mandated Territory; in 1915 Macdonnell crossed from Cape Nelson over the Hydrographers' Range to Port Moresby, and Skelly in the Gulf division visited the Nabo Range and the Kukukuku country behind Kerema. Lyons, who had already explored the surrounding Gogodara country, in 1917 surveyed the Aramia River. In 1922 Flint and Saunders examined the Samberigi valley behind Kikori, and Austen explored the Alice River district and part of the Star Range in the north-western corner. In 1924 Austen and Thompson completed the examination of the north-western corner between the Palmer and Alice rivers, and the former reached the main Fly River 605 miles above its mouth. Many other officials and a few civilians have done unostentatious but valuable work in opening up unknown parts of the Territory.

Physical Features.—With the exception of the low coral Trobriands and a few other small groups, the coastal islands are mountainous and of volcanic formation; the highest is Goodenough Island, which rises to 8000 feet. On the mainland the eastern end is mountainous; as the mountains extend north-westwards, they rise and unite to form a central chain which is known under various names—Stirling, Hornby, Owen Stanley, Albert Victor, Sir Arthur Gordon, and, in the extreme north-west, Star. Towards the Dutch border the range lies farther and farther inland, and south of it the country slopes rapidly to a plain which is in many parts swampy, especially near the coast. The north-eastern shores, on the contrary, are bold. The highest peaks are found in the Owen Stanley Range—Mount Victoria (13,121 feet), Mounts Albert Edward and Scratchley (each 12,550 feet); many others in that range rise to between 11,000 and 12,000 feet. In the Star Range several peaks are probably over 11,000 feet. The most prominent peak seen from the southern coast is Mount Yule (10,380 feet) in the Owen Stanley Range. In the western division, between Torres Straits and the Fly River, are low, grassy, scrub-covered ridges 100 to 200 feet high; rising hills are not met for a distance of 460 miles from the mouth of the Fly. The greater part

of the western coastal area is covered with mangrove swamps, and along most of the estuaries nipa and sago-palm swamps abound.

The largest rivers are the Fly, Bamu, Turama, and Purari. The Fly has been traversed for 605 miles along its main channel, and along its tributary the Palmer to 610 miles from the mouth. It drains the southern slopes of the Star Range and of the Victor Emanuel Range in the Mandated Territory. The influence of the tide is felt 200 miles up this river, and it is navigable for motor launches for over 500 miles. Its main tributary, the Strickland, joins it at Everill Junction, about 240 miles above the mouth. Other tributaries of importance are the Tedi (Alice), the Elevala, the Tully, the Palmer, and the Black. It is estimated that the volume of water discharged by the Fly River would supply 120 gallons a day to every inhabitant of the globe. At new and full moons the river has a 'bore' (tidal wave) from 6 to 12 feet in height, which commences about 40 miles above the mouth and continues with great force and rapidity for more than 80 miles upstream. For the most part the Fly and the Strickland run through low, flat country. The Purari, next in size, is navigable by launch for over 120 miles. It is supposed to rise in the great ranges along the Mandated Territory boundary, north of the Samberigi valley in the Delta division; its length is probably over 400 miles. It enters the Gulf of Papua by a delta which is connected with a huge network of waterways to the west. The Bamu and the Turama have not yet been explored to their source, but are probably over 200 miles in length. Like the Fly, they are subject to bores. Other important waterways from west to east are: the Bensbach, Morehead, Wassi Kussa, Pahoturi, Binaturi, Oriomo, Kikori, Vailala, Tauri, Lakekamu, Biaru, Angabunga, Vanapa, Laloki, and Kemp Welch; many other rivers have a long course, but are too shallow for use except by canoes. On the north-east four large rivers open into the sea—Musa, Kumusi, Mambare, and Gira. All these natural waterways, together with many excellent harbours (Daru, Yule Island, Port Moresby, Bootless Inlet, Port Glasgow, Fyfe Bay, and Sewa Bay in Normanby Island), are of great value for the economic development of the Territory.

Geology.—What is known of Papuan geology indicates a moderately large range of deposits, passing from the Archaean complex of metamorphic rocks and intrusions to simple late Tertiary sediments, which rest upon Mesozoic, Palaeozoic, and pre-Cambrian rocks. The Queensland Mesozoic rocks apparently extend to Papua, and—although the freshwater series have not yet been discovered there—there seems no reason why the productive coal-measures of northern Queensland should not extend to the upper Purari and Kikori regions. Practically the whole of the Owen Stanley Range, the highland portions of the D'Entrecasteaux group, and the Louisiade Archipelago, make up a huge pre-Cambrian complex; the whole central mountain chain is possibly of the same nature, overlaid with later rocks of Mesozoic age. The late Tertiary beds (which include the oil-field series) are strongly developed in the littoral and the hinterland of the Popo, Vailala, Purari, Era, and other Delta districts. Tertiary beds have been found on the upper Fly, Palmer, and Alice rivers, and these extend into the mountains near the border of the Mandated Territory. The divide between the Sepik and Fly head-waters appears to be composed of Miocene limestone. The Delta division beds, being invaded with lava from the Mount Favenc group, have in valleys where they are exposed too gentle a dip to make it worth while prospecting extensively in this area; and in the northern part of the Western division prospecting would be very expensive owing to the distance of the probable oil and coal beds from the coast. On the south-eastern part of the division, round the Oriomo River, a company is prospecting for oil. Oil was first discovered by Lett and Thomas in the Gulf division in 1911, and some years later the Anglo-Persian Oil Company commenced investigations on behalf of the admiralty and the Commonwealth government, but in 1921 the admiralty drew out, and since then the Commonwealth has continued operations alone, with no success up to the end of 1925. The mineral oil and coal ordinance of 1923 came into force in January 1924, and Papua has been thrown open for prospecting and mining for mineral oil and coal, with the exception of the district lying roughly between the Lakekamu River and Yule Island; several private companies have been operating in the Territory, but so far none have had any signal results.

Mining.—The Territory is rich in minerals. Gold, silver, copper, lead, zinc, iron, osmiridium, gypsum, manganese, and sulphur have been discovered, and topaz and beryl pebbles have been obtained from the upper reaches of the Fly. Brown coal has been found in association with Tertiary sediments, but (as with most brown coals) the percentage of water is too great and the seams are too small to allow of its being handled commercially. Gold is worked on a small scale in the Louisiades, on Woodlark Island, and at the Yodda and Gira goldfields in the Northern division; a small quantity is also obtained at the north-western end of Milne Bay. The export of gold for the year ended 30 June 1925 was £14,980, as compared with £6702 for the previous year and £68,726 for 1922; most of this came from Misima in the Louisiades, where the principal mine was closed down in September 1922. Though the whole central mountain chain is supposed to be more or less auriferous, no payable gold-bearing reef or lode has yet been discovered on the mainland. Dredging areas have been granted on the Yodda and Gira fields, but there are no plants on either. Osmiridium is usually obtained in conjunction with the alluvial gold. Copper is worked at the Laloki and Dubuna mines on the Astrolabe mineral-field, about 20 miles from Port Moresby; a jetty has been constructed at Bootless Inlet, where large ocean-going steamers may berth; the railway from the wharf to the Laloki mine is nearly 8 miles long, but the aerial tramway from the mine is only 3½ miles long, and its construction is greatly increasing the output. At smelters erected close to Bootless Inlet the ore is turned into 'blister' copper for exportation. Ore in sight at the two mines is estimated at nearly 300,000 tons. The ore at the Dubuna mine contains 40 per cent of sulphur, 42 of iron, 7 to 8 of silica, and 5 to 6 of copper, with a small quantity of alumina, about 2.5 dwts. of gold, and 0.5 oz. of silver per ton of ore. The Laloki ore is about 2 per cent higher in iron and sulphur, with less silica. The quantity of copper exported from the field since it was proclaimed in 1906, up to 30 June 1925, is estimated at 14,222 tons and valued at £206,136. None of the other minerals known to exist in the Territory have so far been exploited.

The mining ordinances in force adopt with few exceptions the Queensland mining act of 1898. According to the mining regulations of 1922, a reward claim of a certain extent is allotted to discoverers of apparently payable gold, but no monetary reward is granted.

Meteorology.—In the tropics seasons are classified by the rainfall and the prevailing winds. The wet season coincides to some extent with the period of the north-west monsoon, which blows from December to March; the south-east trade-wind blows during the rest of the year, and this in most districts is the dry season—but at Kikori, Kerema, and Milne Bay the heaviest rainfall seems to occur from May to September during the south-east trades. The change of seasons is always marked by a period of about six weeks during which the winds are light and variable, and frequent thunderstorms occur. The south-east trades in their season blow steadily and continuously; in the early morning the breeze is light, increasing gradually in velocity until about 4 p.m. The north-west monsoon, on the other hand, is accompanied by occasional calms, and sometimes by sudden squalls with heavy rain, locally known as 'gubas.' Fortunately for agricultural enterprise, Papua lies outside the hurricane belt. The notion that the climate of the Territory is unhealthy for Europeans is fast dying out; its falseness has been proved by the fact that many settlers and government officials who have lived there almost continuously for 15 to 20 years still enjoy excellent health. Malarial fever is common, but reasonable precautions and the use of quinine as a prophylactic prevent the attack from assuming a malignant character. In the two most populous centres—Port Moresby and Samarai—malarial fever has been reduced to a minimum by discouraging the breeding of the infecting mosquito in the surrounding districts. On the mountains and tablelands the climate is cool and bracing, and fever is practically unknown. The mean annual isotherm at 17 stations during a series of years is 79°. The rainfall, humidity, and average temperature for the year ending 30 June 1925 at the three principal ports are as under:—

	Pt. Moresby	Samarai	Daru
Rainfall (inches)	43.20	93.06	83.91
Humidity	79%	82%	83%
Maximum temperature	85.9°	82.1°	84.6°
Minimum temperature	75.4°	75.0°	74.9°

Magnetic north is east of true north throughout the Territory; the declination increases eastwards at roughly 13 minutes for each degree of longitude. In 1919 the declination between 144° and 145° E.long. was observed to be 4° 41′, and between 145° and 146°, 4° 49′. Between 147° and 148° a series of observations taken over a period of 1910-20 showed the mean declination to be 5° 19′.

Botany and Agriculture.—An alpine flora does not make its appearance below 6000 feet above sea-level. The indigenous flora seems to be largely blended with Australian, Malayan, and Polynesian types. The most important indigenous plants of economic value are: sugar-cane, rubber (both tree and vine), coconuts, wild nutmegs, tobacco, ginger, bamboos, rattans, areca palms, various species of fibres, bananas, breadfruit, edible nuts, native vegetables (yams and taro), and immense forests of sago and nipa palm. The sugar-cane is remarkable for its wide distribution, and the large number of its varieties, and much of the country is admirably suited for its growth. Some of the finest sugar-cane grown in Queensland has been obtained from Papua. Tobacco grows in several regions, and some obtained by Sir William MacGregor from the upper Fly region was said to be excellent for cigar-making. For some time a tobacco factory operated at Port Moresby, and 'trade' tobacco was manufactured; unfortunately a very poor quality was turned out, but this may have been due to lack of expert knowledge, and not to the poor quality of the leaf. This factory has closed down, but with experts to superintend the drying, curing, and manufacture of the leaf, a large local industry could be established, as over £6000 worth of trade tobacco is imported yearly. Two kinds of sago of commercial value (*Metroxylon laeve* and *M. rumphii*) grow in the swampy districts of the Western, Delta, and Gulf divisions. A company was formed to work the sago on the Paibuna River in the Delta division, and to manufacture power alcohol, but it never developed commercially.

Over 120 varieties of timber trees have been found, of which at least 16 are suitable for commercial purposes; but the Commonwealth forestry expert in his 1923 *Report on Papuan Forestry* says: 'There can be no great development of a timber industry in the natural forests of the lowlands of Papua. . . The future of forestry in Papua is wrapped up in the development of minor forest products. These are tannins, alcohol for fuel, paper pulp, wooden matches, veneers and three-ply, fibre plants, rattans, resins, gums, kino, guttapercha, rubber, vegetable oils, ebony, dyeplants, and medicinal plants.' There are, however, two timber companies at work, one at Manumanu near Port Moresby, the other on the Wami River in the Delta division; most of the timber is used locally.

Cotton is now being planted in large areas, and it is hoped that it will eventually develop into one of the chief articles of export. Upland rice has been grown successfully in the Gulf and other divisions. At the end of June 1925 there were 46,000 acres of coconuts under private cultivation and 2400 acres on government plantations. Other private plantations include 7846 acres of rubber, 3878 acres of sisal hemp, 955 acres of cotton, and about 480 acres of other crops, including rice and coffee; these plantations represent an investment of capital of nearly two millions. In addition, kapok, tea, cocoa, cinnamon, and cinchona have been introduced and grown successfully.

Land Tenure.—Land in Papua can be obtained only under lease for 99 years or less; the annual rent is based upon the unimproved value. The maximum rent for agricultural areas of less than 1000 acres is as follows: first 10 years, nil; next 10 years, 6d. per acre; for every 20 years thereafter the unimproved value of the land is appraised, and the rent raised by not more than one-third. One-fifth of the area suitable for cultivation must be planted with approved plants within the first 5 years, two-fifths in 10 years, and three-quarters in 20 years. For pastoral leases the maximum rent for the first 10 years is nil, for the next 10 years 25s. per 1000 acres, increasing thenceforward by not more than a quarter every 20 years during the remainder of the term. Within the first 5 years 10 head of cattle per square mile, or 50 head of sheep, must be on the land; and double this amount within 10 years and after. For all areas over 100 acres the applicant pays a survey-fee at a fixed rate.

Zoology.—The fauna of Papua, like that of Australia, shows great poverty in mammalia,

though both have a large variety of marsupials. Among Papuan mammalia the rodents include various species of field-rats (*Uromys, Pogonomys, Mallomys rothschildi,* and *M. hercules*), water-rats (*Hydromys*) are also represented. Monotremes—*Zaglossus* and *Prozaglossus* (native porcupines)—are found, and the flying fox (*Pteropus*) is widely distributed. The dingo is also indigenous, but the wild pig, which is widespread, was introduced by early visitors from overseas. Of the many marsupials, tree-kangaroos (*Dendrolagus*) and several species of dorcas kangaroos (*Dorcopsis* and *Dorcopsulus*) have been found, also many species of ring-tailed opossums (*Pseudochirus*), at least two species of cuscus (*Phalanger*), four distinct genera of bandicoots (Peramelidae), and two species of native cats (*Dasyurus*). A peculiar marsupial, the 'pouched rat' (*Phascogale*), is said to inhabit the mainland. Of reptilia two species of crocodile are known; three varieties of turtle abound along the coasts, and fresh-water tortoises are plentiful inland; at least three families of lizards are represented, and salamanders, toads, and frogs are numerous. Among the 50 or more species of venomous and non-venomous snakes many are identical with Australian forms. Death adders (*Acanthophis*), black snakes (*Pseudechis*), whip snakes (*Demansia*), at least half a dozen pythons (*Liasis*), and a bright green constrictor (*Chondropython viridis*) occur, as well as a number of freshwater (*Tropidonotus*) and tree snakes (*Dendrophis* and *Dendrelaphis*). About six species of what is known as the *Toxicocalamus* group may be included among the Papuan varieties.

Of the 500 species of birds found in the Territory, from 50 to 60 genera are characteristic of New Guinea alone; the most noteworthy belong to the family Paradiseidae, which includes 70-80 species of birds of paradise, bower-birds, and manucodes. The scrub turkeys (Megapodiidae) make large communal mounds of earth and leaves, in which they lay their eggs, leaving them to be hatched by the heat generated from the decaying vegetable matter. Two varieties of crested pigeon (*Goura*) have been found, with bodies as large as those of well-grown domestic fowls. Cassowaries (Casuaridae) are found in most of the dense forests below 3000 feet. Hornbills (Bucerotidae) of several varieties are abundant. Among the numerous smaller birds may be distinguished brilliantly-coloured kingfishers, pigeons, parrots and lorries, as well as hawks, owls, ibises, wild ducks, and geese. Butterflies of wonderful colouring and size are abundant and include many rare species; Papua, indeed, is a rich field for the entomologist.

The many varieties of land mollusca show a marked relationship to those of Indian and Malayan regions. Along the eastern coasts, more especially in the Trobriand group, pearls of fine lustre are found, and £19,300 worth were exported during the year ended 30 June 1925. Pearl shell, trocas shell, and bêche-de-mer are also collected, and many hundred tons of these commodities have been exported.

History to 1906.—Though Bligh in 1792 annexed the islands between New Guinea and Cape York on behalf of Great Britain, it was not until 1846 that Lieutenant Yule took possession of the southern part of the mainland of New Guinea. His action, however, was not ratified. On 24 August 1873 John Moresby hoisted the British flag on Hayter Island, and annexed the large islands off the east coast, but the British government again rejected the gift. In 1877 attention was drawn to New Guinea by a gold-rush to the area near Port Moresby. On 4 April 1883 the region east of the 141st meridian was annexed to the Empire by Henry Marjoribanks Chester, a police magistrate in the service of the Queensland government; Sir T. McIlwraith, who ordered the annexation, was stimulated to it by rumours of German designs on New Guinea, but the British government poohpoohed the rumours and disavowed the annexation. In the face of united and vigorous protests from all the Australian government, however, the colonial office agreed to the establishment of a 'coastal protectorate' if Australia would contribute £15,000 towards its upkeep. Before the eager Australian assent to this proposal could reach London, Prince Bismarck had notified the British government of his intention to make annexations on the northern side of New Guinea; and, when in October Gladstone and his foreign secretary, Lord Granville, were at last prepared to annex eastern New Guinea except the strip of north coast between Vulcan Island and the Dutch boundary, Bismarck's protest was sufficient to dissuade them again. On 6 November 1884 Commodore James Erskine was allowed to proclaim a protectorate over the south coast, and on the 16th a German protectorate was proclaimed at Friedrich Wilhelmshafen (now Madang) over the north coast as far east as Huon Bay, Bismarck at the same time notifying the British government that further annexations were in prospect. On 21 December, therefore, Granville extended the British protectorate to include the north coast up to Huon Bay, and the boundaries thus laid down were thenceforth considered final, although they were not strictly delimited until 1908-9. On 17 November 1884 Sir Peter Scratchley (q.v.) was appointed special commissioner for the protectorate, but the colonial office was dilatory about his arrangements, and it was not until 22 August 1885 that he reached Port Moresby to take charge. In December of that year he died at sea of New Guinea fever. John Douglas, then the Queensland government's resident at Thursday Island, filled his place for a time, but on 4 September 1888—New South Wales, Victoria, and Queensland having agreed to shoulder the whole expense—the protectorate was converted into a crown colony and William MacGregor (q.v.) was made first administrator.

MacGregor's policy is discussed under his name; it carried out Scratchley's intentions, and laid the foundation on which Australian policy with regard to the natives of Papua is still based. During his term the Anglo-Dutch boundary (which was nominally the 141st meridian) was varied by following the westerly bend of the Fly River. In 1895 he was made lieutenant-governor, but in 1898 was transferred to Lagos in western Africa. The laxer administration of his successor, George Le Hunte (1899-1903), was marked by the massacre on 8 April 1901 of James Chalmers (q.v.) and Oliver Tomkins, missionaries of the London Missionary Society. They were entrapped and killed by Goaribari natives of the Kikori estuary in the Gulf of Papua; in May the murderers' villages were burnt, but an attempt to recover the victims' heads in 1903 was a failure. In 1903 Le Hunte was transferred to the governorship of South Australia, and his successor, Christopher Stansfield Robinson—the first Australian administrator of the colony—committed suicide when a garbled account of his attempt to recover Chal-

mers's head induced the authorities to cancel his appointment. Francis Rickman Barton (1904-7) was the next administrator. On 1 September 1906 the colony was made a territory of the Commonwealth, under the name 'The Territory of Papua,' and in 1908 was placed under the charge of John Hubert Plunkett Murray (q.v.), who had been the colony's chief judicial officer since 1904, and acting administrator since April 1907. It must be remembered that from 1888 onwards the final authority in New Guinea matters was Australian—in 1888-1900 the governor of Queensland, in 1901 and afterwards the governor-general of the Commonwealth.

Administrative System.—The Territory of Papua is administered under the Papua act passed by the Commonwealth parliament in 1905, slightly amended by an act of 1924. The administration is vested in a lieutenant-governor assisted by an executive and a legislative council; the former consists of eight territorial officials and a non-official member of the legislative council, the latter of the same officials and five non-officials nominated by the lieutenant-governor. One of the nominees represents the interests of the Christian missions. Ordinances of the legislative council relating to native labour, immigration, divorce, and certain aspects of land-policy, are not law until they have been approved by the governor-general of the Commonwealth; on the other hand, no Commonwealth legislation extends to Papua unless the act explicitly says so. The seat of government is Port Moresby. The lieutenant-governor has under him a government secretary, a treasurer (who is also chief postmaster and collector of customs), a commissioner for native affairs, a director of lands, surveys, mines, and agriculture (who holds a dormant commission as administrator in the absence of the lieutenant-governor), a chief medical officer (also chief anthropologist), a director of public works, and an official secretary to the lieutenant-governor. These, with the deputy chief judicial officer, are official members of the executive council. The staff also includes a chief geologist and surveyors and land-buyers. The chief judicial officer or his deputy presides over the central court, with a jurisdiction analogous to that of the high court of Australia; appeals from the central court lie to the high court, whose decision is final. For administrative purposes the Territory comprises eight divisions, five of which have subdivisions; they are Western (with headquarters at Daru), Delta (Kikori), Gulf (Kerema), Central (Port Moresby, with sub-stations at Yule Island and Rigo), Eastern (Samarai, with sub-station at Abau), South-eastern (Misima, with sub-station at Losui), North-eastern (Tufi, with sub-station at Baniara), and Northern (Buna Bay, with sub-stations at Iom and Kokoda). Divisions are in charge of resident magistrates, and assistant resident magistrates look after the sub-stations. In each division and subdivision are usually stationed detachments of armed native constabulary under white officers.

The Territory's tariff applies to most imports, including Australian. The ports of entry are Port Moresby, Samarai, and Daru, where also there are post-offices and branches of the Commonwealth savings-bank. At Port Moresby and Samarai there are wireless stations in touch with Australia. Up to August 1925 the Commonwealth navigation act—which explicitly applied to Papua—confined external trade to Australian ports and Australian shipping, and the steamer-service was monthly to and from Sydney. Since that date the application of the act has been withdrawn, and non-Australian shipping firms are allowed to deliver and lift cargo. The coastal service employs two steamers which ply monthly along the coast, and a number of small craft which maintain communication between the head-stations and the plantations in each division. There is also an irregular mail between Daru and Thursday Island.

Financial and Statistical.—At 30 June 1925 (excluding the annual Commonwealth grant of £50,000) the total revenue was £90,798, chiefly derived from customs and excise duties. This is the first real increase since the war. The exports—consisting mainly of copper, gold, pearls, copra, rubber, cotton, and sisal hemp—showed an increase over the previous year of £128,221, the total value amounting to £367,629; and the total value of imports—consisting chiefly of tobacco, prints and other textiles, agricultural products, groceries, metals, and machinery—was estimated at £459,080.

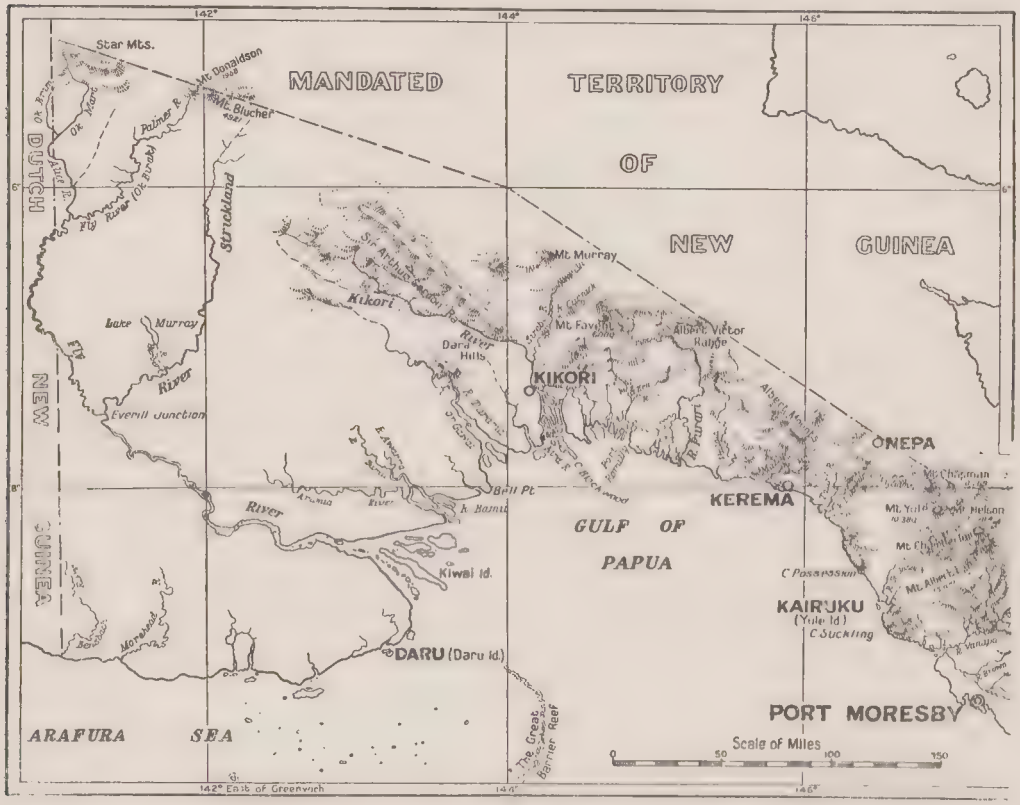
The present white population is a little over 1000; the native population is estimated at 300,000.

Missions.—Five mission bodies operate in the Territory; in order of seniority (*a*) the London Missionary Society, whose sphere of influence includes the whole southern littoral except Yule Island and the Mekeo districts; (*b*) the Roman Catholic Mission, working on Yule Island and Mekeo, which has extended its stations farther inland than any other mission; (*c*) the Methodist Missionary Society, whose sphere is the large islands off the south-east mainland; (*d*) the Anglican Mission, whose stations extend from Chads Bay to the border of the Mandated Territory; (*e*) the Seventh Day Adventists, who operate in the mountainous district behind Port Moresby.

Relations with the Natives.—The Commonwealth in 1906 took over 'a large country, not very fertile, but still capable of considerable agricultural development, and of almost untouched mineral resources—a territory consisting largely of impenetrable swamps and inaccessible mountains, and very scantily populated, principally by head-hunters and cannibals, or at best by semibarbarians only separated from utter savagery by a short generation of very superficial civilization.' Australian policy has since resulted in the advance in civilization of thousands of aboriginal natives (numbers of whom are used by the missions as native pastors, and by civilians and the government in carpentering, plumbing, engineering, and other skilled-labour industries); in the increase of the area under cultivation; in mining development; and in the expansion of exports, imports, and revenue. All this has been done despite the war and the navigation act. And the policy has been, and is, Sir Hubert Murray's.

MacGregor in 1888 initiated a policy inspired by the belief that 'one of our first duties lay in dealing justly and righteously with the native inhabitants.' This has been the basis of the Commonwealth's policy also; it is designed, first, to protect the native in his contact with Europeans, and, without destroying his social life, to lead him to a higher state of civilization; secondly, to make the Territory self-supporting. When Murray took charge, most of MacGregor's actual work had been obliterated during the unsatisfactory period following his administration, and the report of a Commonwealth royal

commission led people to expect too great a return from the soil, and the amount of native labour available; many, therefore, who had invested in Papuan land on the strength of this report blamed the government for their unprofitable returns. The supply of labour is uncertain, and during the next 20 years the number available will probably not exceed 15,000; still, it is possible that the introduction of cattle and labour-saving machinery may compensate for any future shortage. An ordinance prohibiting the entry of coloured races except under certain conditions is intended to prevent the extinction of the natives by an influx of Asiatics. A native labour ordinance fully protects the native as a labourer and causes no undue hardships to the employer. Most native labour is employed under the indenture system, which, though objectionable as a permanent institution, is needful until the natives are better educated. Some settlers favour indenturing women for work on plantations. Others believe better results would be obtained by allowing labourers and their wives to live in villages on the plantations; the great drawback would be that, besides destroying the social life of the existing villages, it would eventually convert the natives into a wandering, landless proletariat. Further,

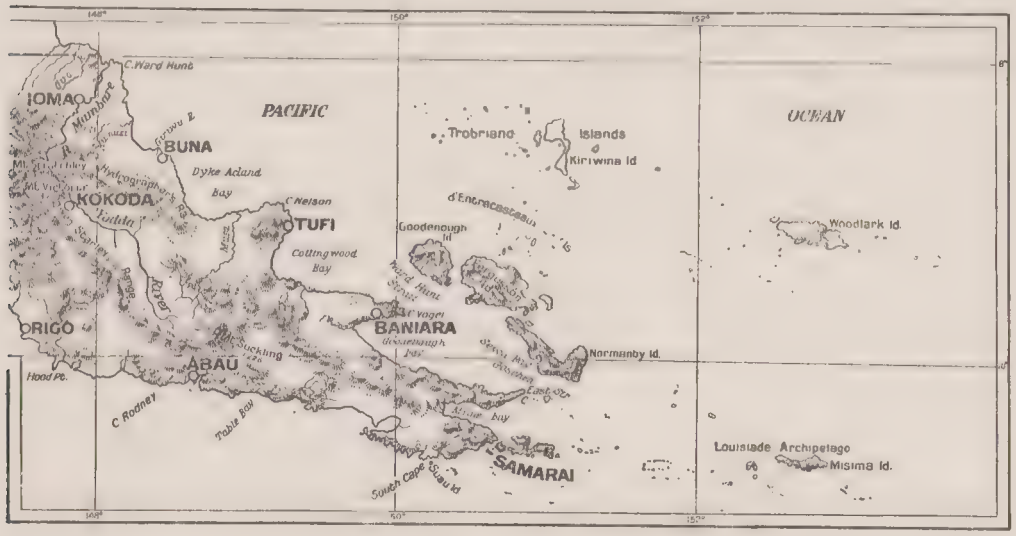


since the advent of the white man, the civilizing influence of the missions and the suppression of harmful customs by the government have done away with many recreations and ceremonials that occupied a good deal of time; some occupation must be found for the natives to prevent them from degenerating into a wretched idleness, and a native plantation ordinance encouraged them to cultivate their own plantations with the assistance of qualified instructors. To provide for their further education, the taxation ordinance of 1919 provided that all male natives between the ages of 16 and 36 (with certain exemptions) should be taxed at rates varying from 5s. to £1 per head, in specified taxable districts—indenture labourers are taxed 10s. per head. The money thus obtained forms a trust fund out of which grants are made (*a*) to missions for primary and technical education of the natives, (*b*) for establishing and maintaining native plantations under governmental supervision, (*c*) for the study of anthropology, (*d*) for the medical care of the natives, (*e*) for village improvements, and (*f*) for the payment of a 'family bonus' of 5s. to the mothers of four living children, with an additional 1s. for each additional child. The balance at credit of the trust fund on 30 June 1925 was £31,449. As time goes on this fund will be largely utilized to establish technical and general government schools for the sole benefit of the natives. Of the proceeds from native plantations about half is credited to the trust fund; the owners are given the balance and exempted from taxes for the year. Rice, cocoa, and other plantations have been started in many divisions, and a rice-mill has been erected at Port Moresby to deal solely with native crops. An anthropologist travels over the country, studying native customs and learning the native view-point; it is hoped that in this way useful or harmless customs may be incorporated with the general policy; the material will also be useful to officials, giving them a more sympathetic insight into native problems, so as to avoid unconscious offences against unknown tribal traditions.

The 'punitive expedition' against whole villages is no longer used, and criminals are arrested without others being involved in their punishment. The Papuan is as secure in his land, and as assured of his freedom, as he was when Commodore Erskine proclaimed the Protectorate; at the same time he is shielded from the ill-effects of alcohol in his contact with the white man —which was the result Sir Peter Scratchley had hoped to achieve.

Anthropology.—The natives of Papua are comprised in three main groups—negritos, Papuans, and Papuo-Melanesians. The *negritos* (a class which includes the pygmies) are a very short, woolly-haired, broad-nosed, broad-headed people found throughout the mountainous country in the north-western corner, in the Upper Fly district, and also round Mafulu and Mount Yule much farther east. The eastern tribes are not pure-bred; probably during some migration they were cut off from the main body to the west, and then were encircled by Papuans, from whom they adopted many customs. The purer type of negrito uses the bow and arrow, and lives in a small square house built on piles, with internal compartments and a sunken fire-place. Along the lower Alice River these piles are often from 40 to 50 feet long, towards the mountains only 9 to 15 feet. The pygmies of the Star Range closely resemble those found in the Tapiro Mountains of Dutch New Guinea. Their height varies according to their purity, but some have been found below 4 ft. 10 in. The dress of the eastern negrito man is a perineal band of bark cloth, and the woman wears a strip of fibre; among the north-western tribes men wear a small nut or part of a gourd as a penal case, women a very short reed 'petticoat.' Arrow-proof cuirasses of plaited rattan have been found in the north-western district. Tattooing is unknown. Boars' tusks, dogs' teeth, and 'Job's tears' seeds sewn into a wide forehead-band, are the main articles of personal adornment. Small jaw-ended cylindrical drums are used in the north-west. As usual among negritos, fire is made by the strap-saw method of rubbing a strip of dry skin from a rattan against a cleft stick. The dead of the north-western tribes are buried in bundles resting on forked sticks, those of the eastern on high burial-platforms; in both regions burials are occasionally made in the earth. Besides bows and arrows, stone clubs are used, and netted string 'dillybags' are manufactured. Bamboo tobacco-pipes are often smoked. The negrito makes gardens in which grow taro, yams, sweet potatoes, and bananas. Wild pigs and cassowaries are hunted, and form the main meat diet. Pigs and dogs are kept as domestic animals. Negrito decorative art is extremely crude, consisting of simple geometric designs—mainly combinations of straight lines.

The more or less true *Papuans* inhabit the coastal and interior lowlands west of Cape Possession. They are distinguished by a great variety of dialects, all belonging to 'Papuan' languages. Physically, they are taller than the other groups; their hair is dark and woolly, and the head dolicocephalic; the face is long and narrow, the nose long, broad, and often



hooked—which gives a pronounced Semitic appearance. Their weapons are the bow and arrow and the stone club. These Papuan-speaking peoples may be classed in six 'culture districts.' (1) in the Middle Fly region, including Lake Murray and the lower Strickland, the tribes grow tobacco and chew betel-nut; build men's ceremonial houses; fashion stuffed human heads; manufacture stone-headed clubs and large hour-glass-shaped drums with handles (see MUSIC, PAPUAN); and carve and paint on trees. Their canoes are long and narrow, without an outrigger; and they have a distinctive type of decorative art, in which vegetable forms combined with spirals appear to play a great part. (2) The Lower Fly (Kiwai) district is characterized by long ceremonial houses, head-hunting (now suppressed), elaborate initiation ceremonies—in which the bull-roarer plays an important part—and kava-drinking, probably of exotic origin. The decorative art consists of rectilinear patterns and representations of animals. (3) The Aramia River (Gogodara) tribes have customs resembling those in the Lower Fly, but kava has a greater signification in all their ceremonies, and very elaborate trappings are used in them. Human heads are decorated, and used in certain dances. There is probably a *manes* cult. Gogodara canoes resemble those of the Middle Fly in shape, but the prows are carved to repre-

sent crocodiles and birds. The carvings of these people are perhaps the best among all Papuan-speaking tribes of the Territory, and most of their carved work is used in connection with their ceremonies. The characteristic decoration is a series of three concentric circles, unclosed in the lower part. (4) On the Turama and Kikori rivers all the tribes have similar initiation ceremonies as well as an Agiba cult (skull shrine); the men's ceremonial houses are somewhat similar to those of the Lower Fly. The natives used to be, and in one or two isolated cases still are, head-hunters. (5) Among the tribes of the Purari delta the 'kopiravi' cult is the outstanding feature. Kopiravi are basket-work monsters which are placed in a screened-off end of the great ceremonial houses, and are only used in certain ceremonies. Their religion appears to be a combination of totemism, head-hunting, cannibalism, and an ancestor-cult. (6) The Gulf of Papua has a distinct cult, the 'kovavo' mask, with which novices are invested at certain initiation ceremonies. At certain rites human-face masks are worn, clearly showing association with an ancestor-cult. Their initiations (which take place only at long intervals) are elaborate and prolonged. The western Papuans have a patrilineal kinship and inheritance. The decorative art of districts 4, 5, and 6 consist mostly of human-face designs.

The natives of the north-eastern coast, from the Waria River to the Musa, may be included among the Papuan types, but other influences have altered their customs very considerably. The use of the bull-roarer in certain ceremonies shows an alliance with the western Papuans, but the 'big feast' ceremonies, and the making of coiled pottery in some parts, undoubtedly show an exotic—probably a Melanesian—culture.

The *Papuo-Melanesians*, found east of Cape Possession, are dealt with below.

See Moresby's *Discoveries in New Guinea* (1876) and *Two Admirals* (1913); D'Albertis's *New Guinea* (1880); J. P. Thomson's *North-east Coast of British New Guinea* (1891) and *British New Guinea* (1892); A. C. Haddon's *Headhunters* (1901); Abel's *Savage Life in New Guinea* (1902); Staniforth Smith's *Handbook of Papua* (1903); Seligmann's *Melanesians of British New Guinea* (1910); R. W. Williamson's *Mafulu* (1912); J. E. Carne's *Coal, Petroleum and Copper in Papua* (1913); J. H. P. Murray's *Papua* (1912) and *Papua of To-day* (1925); Beaver's *Unexplored New Guinea* (1920); Monckton's *Experiences of a New Guinea Resident Magistrate* (1921) and *Last Days in New Guinea* (1922); B. Malinowski's *Argonauts of the Western Pacific* (1922); Humphries's *Patrolling in Papua* (1923); J. H. Holmes's *In Primitive New Guinea* (1924); and E. B. Riley's *Among Papuan Headhunters* (1925). Sir J. H. Murray's official reports on three-power rule in New Guinea (1919), native problems (1921-2) and recent explorations (1923) are valuable, as are the reports on Papuan forestry by Lane Poole (1923), geology by Evan R. Stanley (1923), and anthropology and health by Strong, and the annual *Reports* of the administrators of British New Guinea (1888-1906) and Papua (1906-1925).

L.A.

THE PAPUO-MELANESIANS.—This group inhabits the eastern end of the island, but detached tribes are found at several points along the north coast. Thanks mainly to the researches of Dr. Seligmann—who classified and described subdivisions of the group—the Papuo-Melanesians are much better known than any other natives. As their name indicates, they are racially and culturally akin to the Solomon Islanders and to most of the tribes inhabiting the Bismarck Archipelago. They are brachycephalic, light brown in colour, with rounded face and fuzzy hair; some tribes grow an enormous mop of hair. The women wear thick grass petticoats made of frayed palm or banana leaves, the men only a pubic leaf or perineal string. They make pottery and basket-work, and use well-decorated wooden implements, their decorative art being based on conventionalized animal motives and characteristic spirals. Magic is of immense importance to them, economically and socially. As a rule tribal authority is based on sorcery, the headman being either himself an expert in evil magic or having one at his disposal. Black magic involves the charming of some substance and letting the victim consume it; but remains of food, nail-parings, or hair-clippings are never used for this purpose. They do not fear ghosts; their fears at night or in haunted places concentrate upon malignant living sorcerers or witches, and upon maleficent spirits of non-human origin. As a rule, the dead are buried in the earth, though tree and platform burial are also known in some tribes. The skulls and bones of the buried are sometimes unearthed and used as relics.

The Papuo-Melanesian languages show a distinct linguistic type, akin to the languages of Malays, Polynesians, and Malagasy. The tribes are obviously immigrants from the east and north-east; their purest type occurs on the islands off the eastern coast. The natives of the Trobriand archipelago are in many ways typical. Their fishing-villages are irregular, not very clean, and crammed near the shore. Clean, well-made paths among low scrub and yam-gardens lead to the inland villages, built on the same principle but much more regular and cleanly. Each village stands in a grove of old fruit-trees, which tower above the low scrub or garden-land and make the site of a village visible for miles around. Within this grove the houses are built in two concentric rings, which enclose a circular place in the middle and a street between the outer and inner ring. The inner ring consists of store-houses for yams, built on piles, and as a rule much higher than the living-houses; these are all in the outer ring, stand on the ground, and consist practically of a large thatched roof with a profile like that of a Gothic arch. The chief's house and his yam-house are much larger than the others, and are specially decorated. The chiefs are also privileged to wear certain ornaments, and must always be above the rest, so that commoners crouch or squat when in their presence.

Order, morals, and good form are based upon family and kinship, as well as upon the political constitution of the community. Family life is essentially normal; husband and wife are equally fond of the children, and bring them up and educate them in necessary arts, crafts, and knowledge. The basis of kinship is matrilineal—the child belongs to his mother's family, clan, and village community, inherits mainly from his maternal relatives, and is not considered to be related by blood to his father. The latter's share in procreation is indeed not known to the natives, who believe that a diminutive baby is inserted by a spirit into its mother's womb, where it develops till birth.

Each village community has one headman, makes common gardens on a definite area of garden-land, and acts in many other respects as one unit. A headman of an important village has large sway over a whole district, and may be called a chief in the narrower sense of the word. Four totemic, exogamous clans exist in the Trobriands, and every native belongs to

one of them. Each clan is subdivided into sub-clans. The natives believe that in ancient times human beings lived underground, and that humanity originated by the emergence of groups. Thus at a certain spot called Labai, a man and his sister came out of a hole in the ground; the man carried a white pigeon in his hand and was fully dressed with the distinctive ornaments of a chief. He was the first male member of the chief's clan, of which the pigeon is the totemic animal, and which has a paramount influence all through the Trobriands. But, though he was the first member of the clan, he was not an ancestor, because his children did not belong to his clan: under exogamy he had to marry a girl from another clan, and the offspring of this marriage belonged to that of the mother.

In personal association, far from being an ill-mannered barbarous savage, the native proves himself well-bred, refined in manners, and perhaps somewhat too strict in formalities of behaviour, which to a white man seem heavy and punctilious. Even their amusements are treated seriously and ceremoniously. Thus dancing, which is naturally a passion with them, is associated with an annual festival about a month long, during which the spirits of the dead are believed to return to the village, receive offerings of food and valuables, and rejoice at seeing dances performed in full ornaments every afternoon and informal dances done at night. Sometimes a community, at the instigation of its chief, arranges an extension of the dancing-period, and the performances last for a couple of months, other people coming to admire and to exchange presents. Dancing is almost always accompanied by songs—rhapsodies or epics relating to important historical events, such as daring voyages, bloody fights, or magical miracles. Natives as a rule dance in a circle, the orchestra, singers, and drum-beaters standing in the middle, the dancers in single file spinning round in slow or fast movement, according to the nature of the dance.

Sometimes a community will arrange an additional feast (also month-long), always inaugurated and ended by a great feast and distribution of food, with one or two feasts in between. During some of these the women of the village assemble each evening and sing songs as a choir; at others the men ceremonially display ornaments of red shell-disks and exchange them; or some public game (usually a tug of war) is played every evening, or the natives will ceremonially make, wear, and exchange wreaths of a sweet-scented white flower. Even if no festive period is ceremonially inaugurated and carried on, in each village there is much play towards and at full moon. Women sit down in groups to sing, men gather and talk, children play noisily on the central place, and the youth of both sexes engage in one or another form of love-making. Dancing is performed only during the midwinter dancing-season or a special festive period; but very often the adults join in the playing of the children, and the whole village resounds with screams of laughter. Picnics (especially to the seaside, with surf games and 'mixed' bathing), walks in parties or couples, and visits to other people's villages and gardens, are much practised and enjoyed. On wet, cold, or windy nights pleasures of a more literary character are substituted—the relation of humorous or serious fairy-tales, many of which would not bear repetition in the presence of the prudish.

In all amusements the element of sex plays an important part. Masters of dancing gain the women's admiration and, as a rule, take advantage of this to embark upon a love-affair; feasting and all other amusements are also opportunities for love-matches and intrigues. Young men sometimes make expeditions to other villages, but always run the risk of detection by a jealous rival from that village—whereupon punishment follows. There are also regular excursions of young girls from one village to another, where they choose their partners and spend a night with them. Intrigues are carried on upon the principle that presents have to be given by boys to girls—no girl's love is disinterested. The men often employ love-magic, regardless of age and position. Married women, however, must be faithful in all circumstances, or they are punished severely. Marriage is usually the result of a long and fairly permanent intrigue. There is hardly any ceremony; the girl moves into her husband's house, the two eat a meal and henceforward publicly live together. There is an exchange of presents between the bridegroom and the girl's family.

The Trobriander is extremely industrious and conscientious, takes a definite pleasure in his work, and is ambitious about the results. To be called lazy is a great offence. Everybody is supposed to have a good garden, and in the gardening-season men, women, and children spend the better part of the day in the gardens, all working according to age and capability. In coastal villages the men go out for days on fishing expeditions, while the women are busy collecting shell-fish; when the men come home the women prepare food and occupy themselves with domestic duties, while the men carve or follow some other industrial occupation. The quality of their work is good, and the workmanship of their implements fine, the form being often strikingly beautiful in proportion and finish as well as in decoration and colour. Houses and boats are constructed with a distinct regard to certain aesthetic canons of which the natives are well aware, and the chiefs' houses as well as the sea-going canoes are decorated with excellent carvings. In the yam and taro gardens the ground is scrupulously cleared and kept clean from weeds, the bulbs are planted methodically, and each individual plant is looked after by the owner; gardens are divided into neat squares by sticks placed on the ground, the supports of the yam-vines are made high and strong, and certain constructions which play a rôle in garden-magic are conspicuous and beautiful from the native point of view, but have no practical purpose. All this is done in order to satisfy ambition: everybody knows that his garden will be examined by his fellows and criticized, admired, or derided, according to its merits; and there is nothing that the native likes more than praise, or dislikes more than censure—and especially ridicule.

The Trobriand islander takes a great interest not only in the production of wealth, but also in wealth itself. His outlook is highly materialistic and essentially bourgeois, and he values a man according to worldly possessions. He lives in a state of crass, though primitive, plutocracy, where wealth is the basis of social power, where love, affection, respect, and sorcery have to be bought, and can be bought by all who bid high enough—with one limitation. Wealth, the instrument of power and the basis of social importance, is accessible only to headmen and chiefs, and great wealth to chiefs of the highest rank only. The chief receives the lion's share

of food (especially of garden produce), and no one else is allowed to store large quantities of yams. Now he can, and will, exchange yams for certain objects of value (vaigua, as the natives call it)—large ceremonial blades of green volcanic stone, arm-shells made from *Conus millepunctatus*, and strings of red shell-disks. These objects represent capital, but not currency: they cannot be exchanged at will for objects of immediate consumption, but must be given away by the chief on certain occasions, this practice being incidental to the exercise of his power. Thus when a chief organizes a feast or a communal work (making a canoe, building a house, forming a sailing expedition, making a communal clearing of bush for gardens), or when he needs the services of a sorcerer, he has to give a present of vaigua. But these presents return to him sooner or later in the form of specific tributes—so that capital, broadly speaking, remains always in the hands of chiefs and can never accumulate with commoners.

The economic value of magic is noteworthy. For gardening, each village has a specialist who must belong to that village; as a rule he is the chief or the chief's near kinsman, and is heir to generations of garden magicians. He has to settle dates, decide as to the site of prospective gardens, and in general to act as an expert. Each successive stage of garden-work—clearing, burning, planting, weeding, and harvesting—has to be inaugurated by a special ceremony. Corresponding magical systems exist with regard to certain forms of fishing, as well as with regard to the building of canoes and to certain industrial activities. The art of carving, very important among the Trobriands, rests also on the idea of magical efficacy: each aspirant to the art has to be initiated by a master-carver with a magical formula and rite. Finally, trading and sailing, both conspicuous in the social life of the Trobriands, are associated with magic. The natives export many articles and import others, but their main trade—or at least the form of trade which is by far most important in their own eyes—is the exchange of valuables. The islands east and north-east of the Papuan mainland are linked together in a traditional trading circuit, where two types of articles constantly move in opposite directions. Strings of red shell-disks (called soulava in the Trobriand language and bagi in the dialects about Samarai) travel from the Trobriands eastward to Woodlark Island, and return via Misima, the Louisiades, Dawson Straits, and Amphletts to the southern and south-western villages of the Trobriands; at each stage they are exchanged for arm-shells of a corresponding value. Practically all the valuables of those two classes constantly travel, so that no man can possess any of them for more than, say, a couple of months; on the other hand, he becomes successively the owner of a numberless series of valuables, some of which return to him from time to time. No barter or higgling is allowed in the kula (as this form of trading is called), and it is a matter of honour and ambition always to give a fair equivalent for the value received. As partners in this perpetual motion of circular trading only headmen and chiefs are admitted. Magic is considered essential to successful trading expeditions, nor would anyone dream of embarking upon one without performing the elaborate system of kula-magic. There is also rain-magic, as well as magic for making fine weather and wind.

The mechanism of magic is, as a rule, simple. The main virtue resides in the magical spell, which must be well known. If you know the spell you are a specialist, but very often this privilege is hereditary and cannot be acquired by an outsider. A specialist must observe certain taboos, some permanent, some incidental to the rite—which, as a rule, consists in the reciting of the spell over some substance, generally vegetable matter.

An important department of magic is that directed towards production or removal of illness. All serious disease is regarded as an extraneous something, introduced into the organism by sorcery. The technique for producing disease is the same as that of magic in general: a spell is muttered over edibles, which are then given to the unsuspecting victim—or else leaves are chanted over and then burned in a clandestine manner, so that the fumes reach the victim. For each ailment there is a specific spell; native pathologists enumerate from 20 to 30 different complaints, some of which obviously correspond to rheumatism, throat-disease, large sores, and skin-eruptions, whereas others are classified according to mysterious principles disregarded by modern medicine.

Besides the diseases produced by sorcerers, acute and fatal sickness results from the operations of a witch. Some women can make themselves invisible and travel through the air. They will attack people, eat away the tongue and the lungs, and thus deprive the victim first of reason and consciousness (which dwells in the tongue) and then of life, which ceases when you breathe no more. Illness may also follow upon any break of one of the numerous taboos associated with native social life—especially upon the break of the taboo which forbids sexual intercourse between people of the same clan. Fortunately for those who are in love with girls of their own totem, there exists powerful magic which prevents or cures illness thus contracted. Malignant tree-spirits also produce disease, and are dreaded. There is, however, no fear of any other spirits; the ghosts of the departed do not permanently dwell near their former abode, and never do any harm to anyone. Normally the baloma (ghosts) remain on the island of Tuma north-west of the archipelago; there, undisturbed by the living and letting the living alone, they lead an existence practically identical with their previous life. Only once a year, as has been mentioned above, do they interrupt this normal existence in Tuma and return for about a month's holiday to their former villages, where they are welcomed and entertained. They are often invoked in the magical spells, but are not considered in any way malignant.

In general the natives are not very much afraid of darkness, and a man (or even woman) will walk alone at night from village to village. In this respect they differ noticeably from the natives of the mainland. B.M.

Paradise-fish. See SNAPPER.

Pardalotes. See DIAMOND-BIRDS.

Parinarium, a tropical genus of the family Rosaceae, consisting of trees with alternate leaves. Two species are indigenous to Australia. The calyx-lobes are 5; petals 4-5; stamens numerous; fruit a spherical drupe, with a bony inner coat. The aborigines use the succulent drupes of *P. nonda* (Nonda Tree) as food. The ripe fruit resembles a yellow egg-plum, and tastes somewhat like a mealy potato, but has

a trace of that astringency so common in Australian fruits. Leichhardt found the fruit in natives' dilly-bags and in the stomachs of emus.

P. nonda.

The tree has a soft, close-grained, yellow timber, very strong and easily worked.

Parker, HAROLD, born at Aylesbury in England in 1873, was brought to Brisbane at the age of three, studied wood-carving and modelling at the local technical college, and made the wood-carvings for the New South Wales forestry exhibit which was shown at Chicago in 1893. In 1896 he went to London, and studied under W. S. Frith at the old Lambeth school of art; his first success, 'Ariadne,' which was exhibited at the Royal Academy in 1908, was bought for the Tate Gallery for £1000. He modelled and carved two large marble groups which flank the entrance to Australia House in the Strand, London. He is a regular exhibitor at the Academy, and has also shown at the Old Salon, where he was awarded a *mention honorable* in 1910. The marble head 'Esther' and 'The First Breath of Spring' (both in the Brisbane gallery) were carved direct from life. A bust of his father, carved from Queensland marble, was shown in the Australian pavilion at Wembley. A reduced replica of 'Ariadne' is in the Melbourne gallery. W.M.

Parker, SIR HENRY WATSON (1808-1881), born at Lewisham in Kent and educated for the law, was brought to New South Wales in 1838 by Sir George Gipps as his private secretary. He married into the Macarthur family, was in May 1846 appointed to the legislative council (of which he was made chairman of committees), and, when Gipps left the colony in July of that year, decided to stay in Australia. He retained his chairmanship through three councils, and, when in 1856 the new constitution came into force, stood for Parramatta and represented that constituency in the assembly from March 1856 to December 1857. He lost the speakership by a single vote; then, after four months of partisan quarrels which used up two ministries, he was made premier as the man most likely to reconcile the opposing factions. During his administration the parties were almost equal in number, and in August 1857 his ministry was thrice defeated. He resigned early in September, but before the end of the year had retaliated on his successor, Charles Cowper; parliament was therefore dissolved, and Parker determined to retire from politics altogether. Soon afterwards he returned to England and settled at Richmond, where he lived till his death on 2 February 1881. (Kt.Bach., 1858; K.C.M.G., 1877.)

Parker, SIR STEPHEN HENRY, son of Stephen Stanley Parker of York in Western Australia was born on 7 November 1846, educated at Perth, and called to the local bar in 1868. From 1878 to 1890 he sat in the legislative council, was recognized as the leader of the agitation for responsible government, and was a member of the delegation that went to England to secure the passage of the bill granting it. From 1890 to 1892 he represented York in the lower house, and was then nominated to the council, holding his seat there till 1897. In 1892-4 he was colonial secretary and minister for education in the Forrest ministry. In March 1900 he was sent to London as a delegate from Western Australia to watch the progress of the Commonwealth bill through the Imperial parliament. In September 1901 he was appointed a puisne judge of the State supreme court, acted as president of the arbitration court in 1904-6, and in the latter year was made chief justice. He left the bench at the end of 1913. (Kt. Bach., 1908; K.C.M.G., 1914.)

Parkes, SIR HENRY (1815-1896), born at Stoneleigh in Warwickshire, England, on 27 May 1815, was put to work at the age of eight in the neighbourhood of Gloucester and was subsequently apprenticed to the ivory-turning trade in Birmingham. There for eight years he was an active member of the Birmingham Political Union, which vehemently supported the Reform Bill of 1831 and afterwards developed along Chartist lines; he wrote for *The Chartist* both prose and verse, and spent his Sundays teaching at Yardley Sunday-school—Sunday-schools in those days taking on themselves a good deal of secular instruction as well. The main currents of his life were thus already determined when in 1839 he and his wife migrated as 'bounty emigrants' to New South Wales in the ship *Strathfieldsaye*, which reached Port Jackson on 25 July. After working for a few months as an agricultural labourer on Sir John Jamison's estate near Penrith, Parkes returned to Sydney, tried various occupations (including that of a customs official), and then set up in business for himself as an ivory-turner and toy-dealer. His advanced political opinions brought him into contact with local democrats, and in 1848 he was appointed one of two secretaries for Robert Lowe's political campaign (see SHERBROOKE, LORD); he also took a prominent part in the anti-transportation movement. In December 1850 he established the *Empire* newspaper, of which he remained proprietor and editor until 1858; during the early fifties it was a powerful democratic organ, and in 1854-6 led a strong attack upon what he considered reactionary clauses in Wentworth's constitution

bill. In May 1854 he was returned by the Sydney electors to the legislative council, retained his seat when responsible government was established, but resigned in 1857 owing to the financial failure of the *Empire*; this loss was remedied by sympathizers, and Parkes successfully contested the elections of 1858, but before the end of the year was brought into the insolvency court, terminated his connection with the *Empire*, and resigned from the assembly.

His journalistic work being thus at an end, he was able to devote more time to politics, and in June 1859 was returned at the top of the poll for East Sydney, but resigned his seat in May 1861 on appointment as one of two emigration commissioners to Great Britain; his task was to stimulate the interest of small agricultural capitalists in Robertson's land scheme of selection before survey (see LAND SETTLEMENT and MIGRATION). After a not very profitable 14-months' tour of the northern and midland counties Parkes returned to Sydney, in 1864 was sent to the legislative assembly by Kiama, and in 1866 entered the Martin ministry as colonial secretary. His first important measure was a public schools act which set up a council of education (*a*) to distribute the state subsidy to denominational schools and (*b*) to establish state schools of a non-sectarian character (see EDUCATION, PUBLIC). He was also responsible for the hospitals act of 1866 (which provided for the inspection of hospitals) and arranged with Florence Nightingale to send to the colony a number of trained nurses (see HOSPITALS). In 1867 was passed a municipalities act, the principle of which was not modified until 1905 (see LOCAL GOVERNMENT). During the same year he introduced a bill for volunteer enrolment, a subject in which he had been interested since 1859 (see MILITARY DEFENCE). As ministerial head of the police force he was involved in the sectarian controversy stirred up by O'Farrell's attack on the Duke of Edinburgh, and in September 1868 resigned from the ministry. In 1870 he resigned his seat because of financial difficulties, but was back in parliament in 1872, and in May of that year was commissioned to form his first ministry, which lasted until February 1875. His term of office was not marked by any outstanding achievement; he came into conflict with the legislative council in connection with an electoral reform bill which had to be laid aside; passed a prisons regulation act; and abolished the *ad valorem* customs duties imposed by his predecessors. He also arranged with the governments of Victoria and South Australia to suspend the collection of intercolonial duties for three years—an arrangement which Victoria ceased to honour before the expiry of that period. Towards the end of 1874 his ministry was defeated on a question of the governor's prerogative to pardon Frank Gardiner (q.v.); this was followed by a dissolution, and by a ministerial defeat early in the new session.

In his next premiership (March-August 1877) Parkes accomplished nothing, owing to the confused state of party politics, but in December 1878 he formed a third ministry in association with his old antagonist John Robertson (q.v.). His first important measure was an education act which extended the principle of secular education adopted in 1867, placed the state-school system under the control of a responsible minister, and abolished the subsidy to denominational schools; this measure was bitterly opposed by the clergy, especially by those of the Roman Catholic Church. At an intercolonial conference held in December 1880-January 1881 to discuss a uniform tariff, Parkes carried a resolution affirming the desirability of creating a federal council, but only three colonies voted for the bill by which it would have been formed, and the proposal was dropped. Almost at once ill-health forced Parkes to take a holiday overseas, and on 29 December 1881 he left Sydney for what became a triumphal progress through the United States, Canada, and England. Returning towards the end of 1882, he found the ministry divided, was defeated at the polls, and retired from office on 4 January 1883; in 1883-4 he revisited England (thus missing the intercolonial conference which did create the federal council), and on his return to New South Wales resigned his seat after two months' attendance in parliament, and announced his definite retirement from public life.

A few months later the despatch of the Sudan Contingent (q.v.) in February 1885 brought him back to the political arena. He savagely denounced Dalley's action, returned to parliament as member for Argyle, and was on Alexander Stuart's motion rebuked for having grossly libelled the legislative assembly; but Stuart, though premier, thought better of his original proposal to expel the offender. Almost immediately John Robertson's death left Parkes leader of the opposition, and the protectionist proposals of G. R. Dibbs, Stuart's treasurer, gave him a good election cry; in January 1887, at the age of 71, he swept the polls, and formed what was probably the soundest and most notable ministry of his career, with William McMillan as treasurer and J. H. Carruthers as minister for education. Besides restoring the freetrade character of the tariff, he created the standing committee on public works and the independent board of railway commissioners, concluded and financed the naval agreement made at the colonial conference of 1887 (see NAVAL DEFENCE), and yielded to public pressure over the Chinese issue of 1888 (see IMMIGRATION RESTRICTION). In January 1889 he was temporarily ousted from office, but again defeated Dibbs on the fiscal issue and formed his fifth and last ministry on 8 March.

The rest of his life was devoted to the cause of federation. The federal council was, in his opinion, an inadequate instrument of Australian progress: nothing short of a federal parliament would achieve the end 'One People, One Destiny.' When Major-general Edwards, a British officer brought to Australia to report on military defence (q.v.), recommended the federalization of colonial troops, Parkes seized the opportunity to appeal for political union on a federal basis. His Tenterfield speech of 24 October 1889 brought about a premiers' conference in February 1890 and the calling of a national convention to draft a federal constitution. Parkes was at his best in dealing with a subject that fired the imagination and gave scope for eloquence, and it was expected that he would win over the New South Wales parliament as he had won over the conference of premiers to the federal cause; but before the debates on federation were concluded he met with a serious accident, underwent weeks of enforced absence from the assembly, and on his return found that his personal influence had been undermined. Nevertheless the convention met in Sydney in March-April 1891 under his presidency, and drafted a constitution bill for submission to the parliaments. The attitude of New South Wales

was all-important, for federation was bound up with the fiscal issue. Parkes, despite his free-trade views, put federation first; George Reid (q.v.), an able and a younger man, subordinated federation to freetrade. Nevertheless Parkes with the help of the federal protectionists was able to defeat a hostile resolution by Reid, and the way seemed open for him to bring in the constitution bill. Instead of doing this, however, he gave preference on the notice-paper to local measures—an act which his friends criticized as an error of judgment. After the 1891 elections he retained office only by the support of the new Labour party, and this was withdrawn in October. Parkes resigned office, and was ousted from his position as leader of the free-traders by Reid, whom he detested. He was now an old man, and his mind became warped by personal rivalry. When the Dibbs ministry was defeated in 1894, Reid, not Parkes, was sent for; Parkes was bitterly disappointed, and on 16 May 1895 made known his readiness to coalesce with the protectionists by moving a vote of censure on the Reid government. At the following elections he opposed Reid in the King division, but had lost public sympathy, and was not returned; in February 1896 he made another unsuccessful attempt to obtain a seat at Waverley; on 27 April he died.

Few Australian politicians have so often changed their constituency. To note the changes as they occurred would have interrupted too much the above record of Parkes's political services, and they are therefore given here. He sat for Sydney City (1856), Cumberland North Riding (1858), East Sydney (1859-61), Kiama (1864-9), East Sydney again (1869-70), Kiama again (1869-70), Mudgee (1872), East Sydney again (1872-7), Canterbury (1877-8), East Sydney for the fourth time (1880-2), Tenterfield (1882-4), Argyle (1885), and St. Leonard's (1885-95). In 1869 he was elected by East Sydney and Kiama, but resigned the East Sydney seat in February and the Kiama seat in December. This political inconstancy stamps him as what would nowadays be called a 'temperamental' statesman; but it was this very temperamentalism that helped to make him the great statesman he was—probably the greatest Australia has known. It gave him the intellectual greed that absorbed new ideas and inchoate reforms from all quarters, the zeal that enabled him to carry through the reforms and impress the ideas on the public, the invincible pride that refused to acknowledge defeats, however severe; it made him to the end of his life a force that might be regarded with various emotions (all strong) but could never be neglected. He was, moreover, one of the very few Australian statesmen who knew enough about European politics to see Australia 'to scale,' so to speak—not disproportionately large against a diminished world; for that reason he could meet British statesmen as an equal, and could insist on compliance with Australian desires—as he did during the Chinese immigration troubles of 1888—without appearing (as did several of his contemporaries) merely a petulant schoolboy.

Parkes never lost his early interest in literature. He was always generous to struggling artists and writers (e.g. Henry Kendall), and himself published in 1857, 1885, 1889, and 1895 small volumes of indifferent verse, and in 1892 *Fifty Years in the Making of Australian History*, a two-volume record of his political experiences. A posthumous volume, *An Emigrant's Home Letters*, written to his sister in 1838-43, was published by his daughter in 1896. (K.C.M.G., 1877; G.C.M.G., 1888.)

See Charles Lyne's *Life of Sir Henry Parkes.*

Parkinson, SYDNEY (1745?-1771), born in Edinburgh about 1745, was apprenticed to a woollen-draper, but, finding art more congenial, went to London and was engaged by Sir Joseph Banks to make drawings of a collection of figures and specimens of animals brought from India. In 1768 Banks selected him as natural history draughtsman on the scientific staff of the *Endeavour*; he made 955 drawings (of which 675 were only sketches) during the voyage, and kept an interesting journal, but on 26 January 1771, soon after leaving Batavia, died of a fever which had attacked most of the ship's company in that port. When the *Endeavour* returned to England Parkinson's brother Stanfield claimed his papers and some of his drawings under the terms of his will; Banks thereupon bought the papers from the brother and sold them to Hawkesworth, who used them in compiling the official *Journal*. Stanfield, however, had transcribed the papers and endeavoured to publish them; but Hawkesworth obtained an injunction that delayed publication until after the appearance of his own book. The *Journal of a Voyage to the South Seas in H.M.S. Endeavour,* edited by Stanfield Parkinson, appeared in 1773.

Parliamentary Elections. The use of the ballot (q.v.) is universal in Australia; but only the State of South Australia retains the antiquated system of electing members by a simple majority. The Commonwealth has adopted preferential voting for both the senate and the house of representatives; Tasmania has a system of modified proportional representation; Victoria and Western Australia have preferential systems; Queensland has a system of contingent voting; New South Wales, after a trial of proportional representation for several years, has reverted to a single-seats, 'first-past-the-post' system, but gives the elector the option of exercising a preferential vote.

Commonwealth.—Each of the 75 members of the house of representatives sits for a separate constituency. An elector must vote for all candidates in his constituency, marking their names 1, 2, 3, etc., in the order of his preference. On the first count only No. 1 preferences are counted; if one candidate secures an absolute majority of these, he is elected. If no one has an absolute majority, the candidate with the fewest votes is excluded, and the No. 2 preferences on his papers are distributed to the candidates for whom they were recorded. This process is continued till one candidate has a majority over all the other candidates left in the count. Thus, if there are three candidates, and on the first count Smith has 9000 votes, Jones 7000, and Robinson 5000, Robinson is excluded. If of his second preferences 4000 go to Jones and 1000 to Smith, Jones is declared elected.

For the senate each of the six States is a single constituency represented by six members who are elected for a term of six years, but except in the contingency mentioned below only three of them retire at a time, so that at normal elections each State returns three senators. Should, however, a senator die or resign during his term, the vacancy is filled by the State legislature (both houses sitting together, except in the case of Queensland, which has no 'upper' house); but the substitute holds the position only for (*a*) the remainder of the original

member's term, (*b*) until the next normal election for the senate, (*c*) until a 'double dissolution' takes place (see CONSTITUTIONS). In such cases there will be not three but four seats to fill. Of course if more than one senator dies or resigns the number to be elected is correspondingly increased.

The mechanism of senatorial elections is complicated. The minimum number of candidates for whom the elector must vote is double the number of seats to be filled, with one added (for instance 3+3+1=7); if there are not enough candidates to allow of that being done, the elector must vote for every name on the ballot paper; but if there are more candidates than double the number of seats plus one, the elector need not vote for those which are in excess, unless he chooses; in all cases the names voted for must be marked in order of preference. If candidates prefer to group themselves on party lines, their names are printed on the ballot-papers in alphabetical order within the group, and the names of independent candidates (i.e. those who do not belong to a group) are printed in alphabetical order after the group or groups. The order in which the groups are placed is decided by the initials of the candidates' surnames in a fashion more easily illustrated than described. Thus, let A, C, G, L, P, S, and W be the initials of the surnames of seven candidates, of whom A, L, and S belong to one party, C, P, and W to the other, G being an independent candidate. A, L, and S are the 1st, 12th, and 19th letters of the alphabet, totalling 32; C, P, and W total 42; therefore the order on the ballot-paper will be A, L, S (in a group), C, P, W (in a group), G.

The quota (i.e. the number of votes required to elect a candidate) is one more than half the total number of valid votes cast; thus, if 600,000 votes are cast in a State, the quota is 300,001. Any candidate who on the first count has the quota (that is an absolute majority of first-preference votes) is elected. If no candidate has reached the quota, the one who has polled the fewest votes is temporarily excluded, and the second preferences on his ballot-papers are transferred to the other candidates in accordance with the wishes of the electors; this exclusion of candidates successively at the bottom of the poll is continued until some one candidate attains the quota (in this example 300,001), and is elected. The whole process then begins again. The excluded candidate's ballot-papers are brought back, the second preferences on those of the elected senator are distributed as indicated, and again the lowest candidate is temporarily excluded. The process is repeated as many times as is necessary, until the requisite number of candidates have reached the quota. A little thought will show that under this system the group that secures a majority of 'first preference' votes must win all the seats, provided the voting has been on strict party lines. Those who devised the system for the senate possibly hoped that the members of what they intended to be the States House (see CONSTITUTIONS) would represent not a party but the State.

To elucidate the system further an official example of its working is here given. In an election for a three-member constituency 100 first-preference votes are divided among nine candidates as follows:—Absalom 13, Johnson 25, Jones 11, Keith 12, Knight 8, Robinson 10, Smith 8, Swanson 7, Western 6. No candidate has an absolute majority (i.e. 51 or more), so on the second count Western is excluded and the second preferences on his 6 papers are transferred to their candidates. When this has been done Absalom has 15, Jones and Keith 13 each, and Robinson 11. Next Swanson is excluded, and his 7 votes transferred, making Robinson 17 and Knight 9; then Smith, whose votes bring Johnson to 28 and Keith to 18. Knight's papers (including the one transferred to him from Swanson, which goes to the candidate who is marked third on it) are then dealt with. This gives Absalom 20, Jones 15, and Robinson 19. On the sixth count Jones is excluded, and his 15 papers (including the two from Western and two from Knight) dealt with; all go to Absalom, and bring him to 35. Keith is excluded on the seventh count. His 18 papers (including one from Western and five from Smith) all go to Johnson, making him 46. Robinson, with 19 votes, is excluded on the eighth count; of his 19 papers (including one from Western, six from Swanson, and two from Knight) 18 go to Absalom—one is set aside because no preference for either Absalom or Johnson (the two continuing candidates) is recorded on it. Absalom has now 53 votes—an absolute majority—and is elected.

In filling the second vacancy all the candidates except Absalom are restored to their original position and start afresh. Absalom's 13 first preferences are then distributed to the candidates to whom their second preference has been given, and the other processes of exclusion and distribution are carried out as before, until on the seventh count Jones has 54 votes, and is elected to fill the second vacancy. For the third vacancy all the candidates are restored except Absalom and Jones. Their votes are assigned to the continuing candidate next in order of preference; thus, if a paper is marked Absalom 1, Jones 2, Knight 3, it is now counted to Knight. A repetition of the processes of exclusion and distribution results in the election of Knight with 54 votes.

From the way in which the votes are transferred it is obvious that Absalom, Jones, Knight, Robinson, Swanson, and Western form one party group and Johnson, Keith, and Smith another. Though the second group has 45 first preferences against the first's 55, it does not win a single seat. And, provided there were no cross-voting, it would not win one if the figures were 49 to 51. Though no such case has been recorded, it would be quite possible for a candidate who did not receive a single first preference to be elected to the senate if his party had the majority of first preferences and the ballot papers had been marked on strictly party lines.

Following the example of Queensland, the Commonwealth adopted compulsory voting for both the senate and the house of representatives at the elections of November 1925, a penalty of £2 being imposed on enrolled persons who without sufficient reason did not record a vote. This drastic law was effective. The percentage of voters to electors enrolled was 91.31 (males 91.62, females 90.99); the effective percentage was somewhat higher, since the number of names on the roll is always slightly in excess of the actual number of electors. The proportion was highest in Barton (New South Wales) where it was 95.37, and lowest in Kennedy (Queensland) where it was 83.4. At previous elections the percentage varied between 77.69 and 53.04 for the senate, and between 78.3 and 55.69 for the house of representatives.

New South Wales.—Starting with 54 members, elected in 32 districts, the New South Wales legislative assembly grew till in 1894 there were 74 electorates and 141 members. This was the highest number reached, and in 1904, as the result of a referendum following upon federation, the number of members was reduced to 90. In 1918 a system of proportional representation voting was adopted, under which the 90 members were elected by 24 electoral districts. Eight electorates in the metropolitan area, and the city of Newcastle, were represented by five members each; 15 electorates returned three members each. A modification of the system was carried in 1922, the elector being required to record preferences only to the extent of the number of candidates to be elected. In 1926, after a contest with the legislative council in which it sought to secure the adoption of an unqualified 'first-past-the-post' single-seats system, the government accepted a compromise, which, while it provides for the abandonment of proportional representation and a redistribution of the electorates into single seats, permits the elector, if he so desires, to exercise a preferential vote, though a single vote is all that is strictly necessary. The number of members remains at 90. Chief among the objections made to proportional representation were that the electorates became too large, that undesirable rivalry and duplication of effort on the part of members for the same electorate resulted, and that the system failed to provide a satisfactory working majority for whatever government gained office.

Members of the legislative council are nominated to their position by the State governor on the advice of his ministry. The number of councillors varies; for many years it has been roughly two-thirds of the number sitting in the assembly, but in 1921 it was brought up to 75 and in 1925 to 99, although the legislative assembly has only 90.

Casual Vacancies.—In 1920 provision was made that any casual vacancy in the New South Wales legislative assembly should be filled by the candidate for the same constituencies at the last election who, while unsuccessful, represented the same party interest as the late member, and who, upon the count of the primary preference votes then polled, was highest on the list in respect of such votes for unsuccessful candidates representing that party interest, provided that he was willing to be elected, and available to fill the vacancy. In determining what party interest had been represented by the late member, the clerk of the assembly was to have regard to his vote or votes on any motion or motions of censure during the existing parliament. This last-mentioned provision was called into use in July 1926, when A. D. Kay, a member for North Shore, who was elected as an Independent, was appointed by the Labour government to a position on the meat board. On the ground that Kay had voted with the government on a censure motion, an unsuccessful candidate—A. Tonge—was nominated by the government for Kay's seat, although he had polled 3995 votes less than the quota necessary for election. The circumstances caused a heated controversy, and it was urged that, to have maintained consistency with the principles of proportional representation, provision should have been made to continue the count and distribution of preferences cast at the general election. The 1926 act, abolishing proportional representation, provided that the casual vacancies provision should carry on for the life of the then existing parliament.

L.G.W.

Victoria.—For the legislative assembly this State is divided into 65 one-member electorates. Since 1911 a system of preferential voting has been in use, electors voting for all candidates in order of preference by placing numbers before their names on the ballot-paper. The candidate with an absolute majority of first preferences is elected; if no candidate has such a majority, the candidate lowest on the first count is excluded and his second preferences are distributed, and this process is repeated until one candidate obtains an absolute majority. Should two candidates obtain the same number of votes, the returning officer's choice is elected.

For legislative council elections the State is divided into 17 provinces, each returning two members; the tenure is for six years, and one member retires every third year, the method of election being the same as for the assembly. In case of a dissolution, when both members retire, the elector must strike out the names of the candidates for whom he does not intend to vote. The two candidates with the highest number of votes are then elected, the method being 'first past the post.'

Queensland.—Voting on a modified system of optional preferential voting is compulsory. The elector has to strike out the names of the candidates for whom he does not intend to vote, and may then, if he likes, indicate by figures his preferences among the rest. If in a one-member constituency no candidate receives an absolute majority, all except the two highest are declared defeated. Votes given to defeated candidates are then allotted to the two still in the running according to such preferences as the voter may have declared. Where two members are to be returned, and there are not more than four candidates, the two highest on the first count are declared elected. If there are more than four candidates, and none has an absolute majority, all except the four highest are defeated, their votes are distributed as in the one-member case, and the two candidates then ahead are elected. If one candidate receives an absolute majority of votes, he is elected and all except the two nearest to him are defeated. Distribution then follows until one of the two is elected.

Queensland has no second chamber. See QUEENSLAND.

South Australia.—This State has eight districts returning three members each to the house of assembly, and eleven returning two each. Electors may vote for one candidate only, or for the full number to be elected. The method of voting is to place a cross opposite the elector's choice. There is no transfer of votes.

There are five legislative council districts, each returning four members. The voting system is the same as for the assembly.

Western Australia.—Preferential voting, which had previously been optional, was made compulsory in Western Australia in 1911. There are 50 single electorates for the legislative assembly. The elector has to indicate his first preference by the number 1 and to give contingent votes for all the others, in order of preference, if there are more than two. If he marks all but one, it is held that the next number is intended to be placed opposite the name of the remaining candidate, and the vote is valid; it is also valid if the first preference is indicated by a cross instead of by the figure 1.

If a candidate has a majority of first prefer-

ences, he or she is declared elected. Otherwise the candidate with the fewest first preferences is excluded and his votes are distributed among the other candidates, this process being continued until one candidate has an absolute majority. If there are two candidates left in and neither has an absolute majority, the one with most votes is elected.

For the legislative council the State is divided into ten provinces, each returning three members.

Tasmania.—This State is divided into five constituencies for federal elections; these are used for State elections also, each returning six members to the house of assembly under the Hare-Clark system of proportional representation. The elector must place opposite the names of three candidates the numbers 1, 2, 3, in order of choice. He may show as many more preferences as he pleases. The returning officer counts the number of first choices, and fixes a quota by dividing the number of valid ballot-papers by seven (one more than the number of members to be elected) and then adding one to the quotient (thus, if there are 14,000 valid papers, the quota is 2001). Any candidate who on the first count secures or exceeds the quota is elected. If he exceeds the quota, his surplus is divided by the quota to find the transfer-value (thus, if the quota is 2001 and the surplus 667, the transfer-value is one-third). The number of second choices for each unelected candidate is then multiplied by the transfer-value and the result (disregarding fractions) is added to the number of first choices for that candidate. When by this process the number of a candidate's votes is raised to, or above, the quota he is elected.

If the transfer of votes does not result in the election of the required number of candidates, the lowest candidate is excluded and his votes are transferred to the candidates next in order of preference on his papers. The process of exclusion and transfer is continued until all but six candidates have been excluded, and these six are then elected. In determining which candidates are next in order of preference any candidate who has been elected or excluded is not considered, and the next candidate is taken. In a by-election, when one candidate only is to be elected, the lowest is excluded unless one candidate has secured a majority of the formal votes. Each vote given to him is (unless it is exhausted) transferred to the candidate next in order of preference. If no candidate then has an absolute majority of votes, the process is continued until one has an absolute majority. If on the final count two candidates have an equal number of votes, the returning officer decides which is to be elected. The working out of the results of a Tasmanian election involves elaborate mathematical work on the part of the returning officers and their staffs, but all the electors have to do is to put numbers opposite the names of the candidates in the order of preference.

For the legislative council there are 13 country divisions returning one member each, the Hobart division returning three members, and the Launceston division returning two members.

T.D.

Proxy-voting in parliament.—In every parliament in the British Empire there has developed a system known as 'pairing,' by which two members on opposite sides may agree to absent themselves from the house at the same time, the loss of one vote thus compensating for the loss of the other. The refusal by the opposition in the Queensland parliament in 1922 to grant 'pairs' to members of the government party brought about the passing of an act allowing members in certain circumstances to vote by proxy. This was the first application of such a practice in any popularly elected house in the Empire, although for some years until 1867 it had been permitted to peers in the house of lords—a precedent upon which the Theodore government based the innovation. The government had a majority of only one vote at a time when the fiercest political animosity prevailed, and the opposition refused to grant a 'pair' to William McCormack (afterwards premier). For this reason on 16 August 1922 E. G. Theodore introduced the legislative assembly act amendment bill, 'making provision in certain cases for voting by proxy of members of the legislative assembly, absent through ill-health.' The bill was fiercely contested, but was carried through its various stages on the casting-vote of the speaker or the chairman of committees, and received assent on 22 August. It enabled members to make application, accompanied by a medical certificate, to the speaker to have their votes recorded by proxy. The principal argument advanced by the government was that the opposition, by refusing 'pairs,' was seeking to deprive constituencies of their right to be represented. On the other hand, the opposition contended that both custom and the constitution required a member to record his vote personally. On the afternoon that the speaker received the governor's assent to the bill four government members (including McCormack) were ill, and Theodore, having presented the necessary medical certificates, claimed proxies for them. During that session he exercised the right on 35 occasions. A few months later a general election gave him a working majority, and the practice was discontinued, though the act still remains capable of full application.

F. McK.

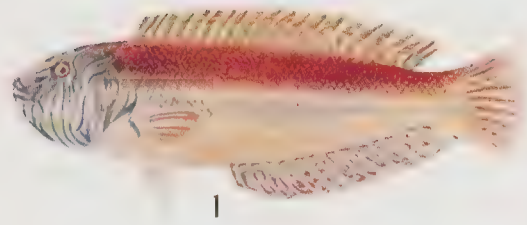
Parliaments. See CONSTITUTIONS, STATE AND FEDERAL.

Parrakeets. See PARROTS.

Parramatta, a town of about 15,000 inhabitants (census of 1921), distant from Sydney 18 miles by water, 15 by road, and 14½ by rail, lies astride a little creek which—because the tidal estuary into which it flows is of considerable size—is called the Parramatta River.

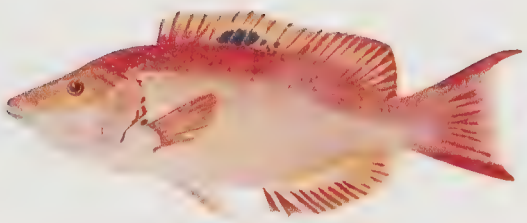
In April 1788 Phillip, convinced that no settlement on Botany Bay or Port Jackson could ever become self-supporting in food-supplies, discovered just above the head of navigation on the Parramatta estuary an area much more suitable for agriculture. Here on 2 November he planted a settlement which he named Rose Hill after George Rose, a secretary of the British treasury and friend of William Pitt the younger, who afterwards held minor political offices under Pitt, Portland, and Perceval. Phillip thought—and Dundas agreed with him—that this area should have been the site of the first settlement. By 1790 about 40 acres had been cleared, and most of it laid down in maize; potatoes failed, but cabbages, melons, and pumpkins throve 'astonishingly,' a cabbage cut for the King's birthday in 1789 weighing 27 lb. The first grapes grown in Australia were cut in the garden of the governor's house on 24

PARROT-FISHES AND WRASSES *Plate XXXV*

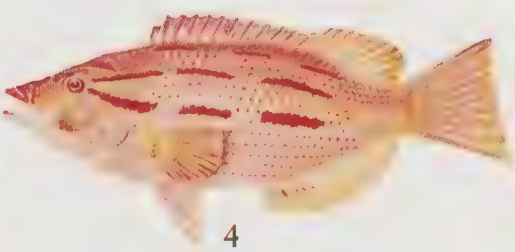


1

2



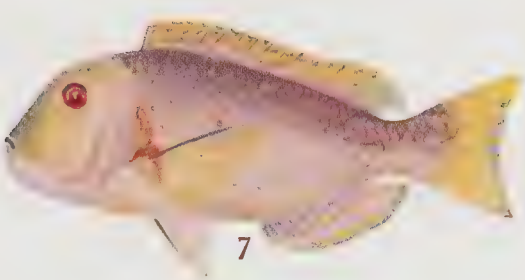
3



4

5

6



7

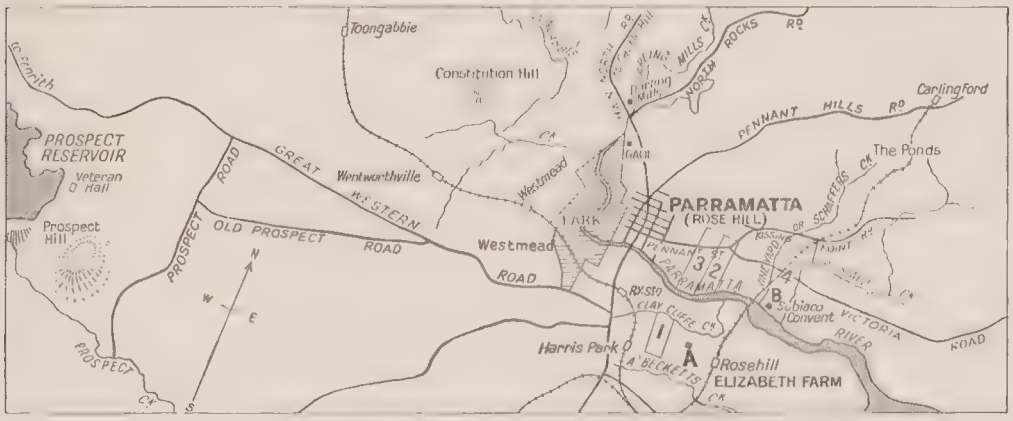
8

1. Maori (*Ophthalmolepis lineolatus*). One-fifth natural size.
2. Crimson-banded Parrot-fish (*Pseudolabrus gymnogenis*). One-fifth natural size.
3. Spotted Pigfish (*Verreo oxycephalus*). One-sixth natural size.
4. Banded Pigfish (*Verreo oxycephalus*, var. *bellis*). One-sixth natural size.
5. Groper (male) (*Achoerodus gouldii*). One-tenth natural size.
6. Groper (female) (*A. gouldii*). One-eighth natural size.
7. Blue-spotted Groper (*Choerodon venustus*). One-sixth natural size.
8. Rock Whiting (*Neoodax semifasciatus*). One-fifth natural size.

January 1791. On 4 June of that year the name of the settlement was altered to Parramatta, the name Rose Hill being reserved for the small hill (now in Parramatta Park) on which Phillip's house stood. At that moment Parramatta was all but the capital; 'Sydney,' wrote Tench, 'has long been considered as only a depot for stores, it exhibits nothing but a few old scattered huts and some sterile gardens, cultivation of the ground is abandoned, and all our strength transferred to Rose Hill.' There the majority of the convicts were stationed, and all the artificers were employed in building huts; the streets were planned 200 feet wide, the principal street a mile long; a church, barracks, a hospital, and residences for all the principal officials were in course of erection. But Hunter, though no farmer, had already noted that the soil, though better than any nearer the sea, was merely a thin layer of humus on a deep bed of sand, and would require 'much manure, much dressing, and good farmers to manage it, before good crops can be expected from it.' Writing in October 1792, George Thompson described the settlements thus:—

> Sydney is the spot where the first settlement was formed, merely for the advantage of good water and the conveniency of the harbour. In this part are only gardens sufficient to supply the inhabitants with vegetables, etc. . . . . Parramatta is the grand settlement.

At that time it had 1970 inhabitants against Sydney's 1170, but thenceforth began to lose ground; the foundations intended for the church became those of a gaol, which in a short time was transformed to a granary. Two factors decided the rivalry. To Parramatta all imported goods must be brought by water up a shallow tidal estuary, so that Sydney must remain the port of discharge for oversea vessels; moreover, as soon as the Hawkesbury lands were opened up, Parramatta fell into the background as a food-supplying area—and there seemed no reason for interposing between the farm-lands and the port a capital that could neither grow wheat nor accommodate shipping.



PARRAMATTA DISTRICT.

A. John Macarthur's Home. **B.** Hannibal Macarthur's Home (now Subiaco Convent). Grants to first rural settlers (30 March 1791) shown thus:—1, James Ruse (30 acres); 2, Robert Webb (60 ac.); 3, William Reid (60 ac.); 4, Phillip Schaffer (140 ac.).

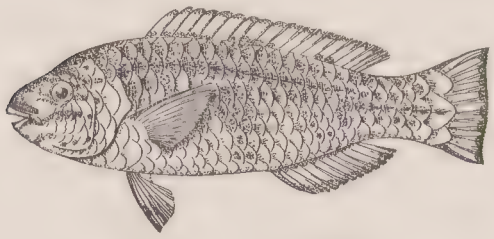
Still, Parramatta had its attractions. Among its early settlers are counted James Ruse (q.v.), who put in the first wheat crop; Phillip Schaffer, the first free immigrant settler; William Batman, father of John Batman; and John Macarthur, the inventor (one might almost say) of the Australian merino sheep. Round it spread the smaller farm-settlements, Toongabbie and Castle Hill and Newington and the Field of Mars. In 1796 the town was organized into police divisions, and all the houses were numbered. In 1803 a coach-service to Sydney was established and a water-mill erected on the creek. St. John's church, the first (except Johnson's wattle-and-dab structure, for which see CHURCH OF ENGLAND) in Australia, was of slow growth; its foundations were laid on 5 April 1797, it was opened for service (without pews) on 10 April 1803, completed about 1808, and furnished with twin towers in 1815-16. These towers were added at the request of Governor Macquarie's wife, whose last sight of England had included the twin towers of the Saxon church at Reculver in Kent. In 1852 the church building was taken down and a new church built on to the old towers. Macquarie added to the public buildings a female orphan school and a new hospital, besides rebuilding government house; Brisbane, who spent at Parramatta as much of his time as possible, on 1 May 1822 opened an observatory in the park (see ASTRONOMY). In 1838 the town boundaries were delimited by David Lennox and in 1839 marked with inscribed stones.

As settlement spread—and especially when it crossed the Blue Mountains westwards and occupied the Hunter River valley to the north—the agricultural importance of Parramatta dwindled, and it became merely the centre of a small farming and fruit-growing district; but it retained social importance as the country seat of the governor. On 7 December 1847, however, a carriage accident in the park killed the wife of Governor FitzRoy and crippled the governor himself; from that time the Parramatta government house fell out of favour, and in the end became a private boarding-house. It is now occupied by The King's School. The town served as the temporary terminus of the first New South Wales railway in 1855, and was incorporated in 1861.

The name Parramatta is usually said to be an aboriginal word meaning 'Eels sit down,' and eels are still abundant in the creek. Elizabeth Macarthur, however, writing in 1795, said the name meant 'head of a river.'

Parrot-fishes. This name is commonly applied to a large number of brightly-coloured fishes belonging to several allied families. The true parrot-fishes of the family Scaridae are characterized by the possession of beak-like

jaws, with which they break off pieces of living coral to obtain the polyps and worms within it. The throat is provided with remarkable teeth that coalesce to form grinding-plates, between



Callyodon pyrrhostethus.

which the coral is triturated before being swallowed. All true parrot-fishes are inhabitants of tropical waters, and a number occur in the warmer waters of Australia. It is probable that many of the so-called species are merely sexual forms, the males differing from the females in marking and colouring; the young also differ from adults. Parrot-fishes are common in the neighbourhood of coral-reefs and, when fully grown, are usually so gorgeously coloured as to vie with any other form of life, terrestrial or marine. See WRASSES.

In southern Australian waters the Scaridae are replaced by fishes of an allied family (Neoodacidae) which also have teeth that coalesce into beak-like structures. They include the rock whitings (*Neoodax*, shown on plate XXXV, fig. 8) and the herring cale (*Olisthops*)—both inaptly named, as the fishes have no affinity with either whitings or herrings. The herring cale is strangely variable in colour, the male being usually bluish-black with blue stripes on the fins, and the female greenish mottled with orange; but these colours are sometimes reversed in the sexes. The Rainbow-fish (*Heteroscarus filamentosus*) is another brilliantly-coloured representative of the family, and, together with its allies, is captured near rocky reefs on the coasts of the southern half of Australia; its beak-like teeth distinguish it from a wrasse, which is also known as rainbow-fish or maori.

A.R.McC.

Parrots, birds of the order Psittaciformes, as a rule brilliantly coloured, possessing very stout hooked beaks, and feet with two toes turned forward and two backward—usually noisy, associating in flocks, and nesting in holes in trees. Many in captivity can be taught to whistle tunes, but few Australian parrots—as distinct from cockatoos—learn to talk. All parrots lay white eggs, and feed their young by regurgitating partly digested food. They occur in Central and South America, tropical Africa and southern Asia, and throughout the Australian region, being more numerous in our region than in any other, and presenting greater diversity of form. Australia and Tasmania possess 46 species; as several of these have been discovered in comparatively recent years it is not improbable that still others remain unknown. Their classification is a matter on which there is considerable difference of opinion. The Australian forms have recently been placed in seven families, which present fairly distinct characters, and these will be adopted here. Cockatoos are dealt with in a separate article.

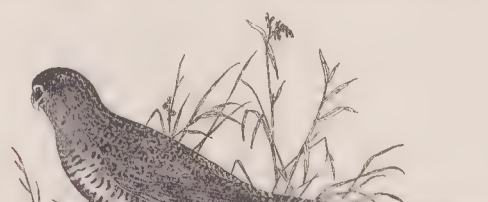
The lorikeets (Trichoglossidae) are mostly small parrots, peculiar to Australia and the Malay Archipelago, characterized by their brush-like tongues, by the aid of which they extract honey from flowers and pulp from juicy fruits. They are very noisy birds, travelling swiftly in small parties, screaming as they fly, and assembling in large numbers wherever many honey-bearing trees (such as eucalypts, banksias or bottle-brushes) are in flower. The best-known and most gaudy of the seven Australian species, generally called Blue Mountain Parrot (*Trichoglossus moluccanus*) is plentiful throughout eastern Australia from Cape York to Tasmania. The Musk Lorikeet (*Glossopsitta concinna*), a smaller bird, is remarkable for its musky smell. The Purple-crowned Lorikeet (*Glossopsitta porphyrocephala*) is the only member of the family that has reached south-western Australia, in spite of the abundance of honey-making plants in that region.

The fig-parrots or lorilets (Opopsittidae) are small birds characteristic of the Papuan region. Two species are found in Queensland, but they frequent jungles and are very little known.

The Cockatoo-parrot or Quarrion (*Leptolophus hollandicus*), known to bird-fanciers as the cockatiel, is the sole member of the family Leptolophidae. It is common in the inland areas of the continent, feeding largely on the seeds of grasses and herbage. As it possesses a crest, the cockatiel has been regarded as a relative of the cockatoos, but it is probably more nearly related to the parrakeets.

Until 1913 it was not known that the true parrots (Loriidae), large stout birds with comparatively short tails, were represented in the Australian fauna. In that year, however, Dr. W. MacGillivray obtained on the Pascoe River in northern Queensland specimens of two large parrots previously known only from New Guinea. One of these, the Red-sided Parrot (*Lorius pectoralis*), is remarkable for the great difference in the coloration of the sexes, the male being chiefly green and the female bright blue and red.

The family Polytelidae contains five moderately large species of long-tailed parrakeets—about 16 inches in length—of which the best-known is the gaudy King Parrot (*Aprosmictus scapulatus*) of eastern Australia. The delicately tinted Alexandra Parrot (*Polytelis alexandrae*), another member of this family, is an inhabitant of the most arid portions of the continent, its range extending from the Macdonnell Ranges



Ground Parrot (*length* 13 *in.*).

in central Australia westwards to the East Murchison goldfields of Western Australia, north-west nearly to the Fitzroy River.

The great majority of Australian parrots be-

long to the family Platycercidae, the broad-tailed parrakeets. The most familiar broad-tails are the Rosella (*Platycercus eximius*) of south-eastern Australia and Tasmania, the name of which is derived from Rose Hill, near Sydney, where it was first observed; the so-called Crimson Lowry or Pennant Parrakeet (*P. elegans*) of eastern Australia; the Adelaide Rosella (*P. adelaidae*), of the Mount Lofty ranges in South Australia; the Mallee Parrot or Buln-buln (*Barnardius barnardi*) of the interior of eastern Australia; the Port Lincoln Parrot (*B. zonarius*) of South and Western Australia; and the Twenty-eight (*B. semitorquatus*) of the south-west, whose name is derived from its note. These are the species commonest in southern Australia, and most often seen in captivity. To this family belong also the grass-parrakeets (*Neophema*), which are largely terrestrial in their habits, feeding chiefly on grass-seeds. One of them, the Rock Parrakeet (*N. petrophila*), nests in holes in the cliffs of islands off the coasts of South and Western Australia, sometimes visiting the mainland to feed. Several members of the family have become almost or quite extinct since the settlement of Australia.

The ground parrakeets (Pezoporidae), peculiar to Australia, comprise three species, the best-known being the Budgerigar or Shell Parrot (*Melopsittacus undulatus*), very abundant throughout the interior and a familiar bird in aviaries throughout the world. The Ground Parrot (*Pezoporus wallicus*) inhabits open heathy country near the sea along the southern coasts of Australia and in Tasmania. It is completely terrestrial in habits, running swiftly on the ground, never even perching in a tree, and laying eggs in a hollow among the herbage. It appears to be rapidly approaching extinction. Its congener, the Spinifex or Night Parrot (*Geopsittacus occidentalis*), is apparently now extinct. It formerly occurred in spinifex country in central and western Australia, and is said to have been nocturnal in its habits and completely terrestrial. Considering the unaltered character of its habitat and the great area over which it was formerly found, its extinction is not easily accounted for, and cannot be attributed to human agency—unless it has been caused by the introduction of cats, which have penetrated into regions beyond human settlement.

W.B.A.

Parry, Henry Hutton (1827-1893), son of Thomas Parry, bishop of Barbados in 1842-69, was born in 1827, educated at Rugby school and Balliol College, Oxford (B.A., 1851; M.A., 1858), ordained deacon in 1851 and priest next year. Under his father he did parochial work until 1855, was tutor at the local theological college till 1860, and then became archdeacon of Barbados (1861) and coadjutor-bishop (1868). In 1876 he was given a doctorate by the university of Durham, and was appointed to the see of Perth. He died in office at Bunbury on 16 November 1893.

Parry, Sir William Edward (1790-1855), fourth son of the notable physician and experimental agriculturist Caleb Hillier Parry, was born at Bath in England on 19 December 1790, and entered the navy in 1803 (lieutenant, 1810; commander, 1820; captain, 1821; rear-admiral, 1852), serving during the Napoleonic wars in the Channel, North Sea, Baltic Sea, and Arctic Ocean. The last-mentioned service, which involved three years' protection of English whalers off Spitzbergen, turned his attention to Arctic exploration, and from 1818 to 1828 he was almost wholly occupied with Arctic voyages, in the *Alexander* (1818), *Hecla* (1819-20), *Fury* (1821-3), and *Hecla* again (1824-5 and 1827-8)—in the last voyage reaching a latitude (82° 45′ N.) which was not reached again till 1876. His first *Hecla* voyage (in search of the north-west passage) was rewarded by election to a fellowship of the Royal Society in 1821; for the *Fury* voyage he was made acting hydrographer to the admiralty, an appointment confirmed in 1825. On 13 May 1829 he resigned this position to take up the commissionership of the Australian Agricultural Company (q.v.), whose affairs in New South Wales were in a bad state. He reached Sydney on 23 December 1829, established friendly relations with Governor Darling, and in the next four years inspected and secured for the company 600,000 acres of excellent land on Liverpool Plains, reorganized its coal-mining enterprise and obtained a definite grant of 2000 acres at Newcastle, and brought much-needed order and discipline into the management of the estates. In 1834 he handed over the management to Colonel Dumaresq and returned to England, where from 1837 onwards he was employed by the admiralty in various duties, ending his life as lieutenant-governor of Greenwich hospital. He died at Ems, while under medical treatment, on 7 July 1855. (Kt. Bach., 1829.)

See Gregson's *Australian Agricultural Company, 1824-1875* (Sydney 1907).

Parsley, Wild. See Apium.

Pasco, Crawford Aitcheson Denham (1818-1898), son of the Lieutenant Pasco who made the famous Trafalgar signal for Nelson in the *Victory* and later, in command of H.M.S. *Hindostan*, brought Macquarie out to Australia and took Bligh back (Macquarie praised him highly and wanted him as naval officer for the colony), was born at Plymouth in 1818, entered the navy in 1830, and in 1837 was appointed to H.M.S. *Britomart*, which under Owen Stanley sailed in January 1838 with Bremer in H.M.S. *Alligator* to establish a settlement at Port Essington. Next year he was transferred to H.M.S. *Beagle*, and under Wickham and Stokes took a large share in surveying both the north-western coast (1839-41) and Bass Strait (1842). After nearly 10 years of further service (largely in the Malay Archipelago) he returned to England, obtained two years' leave, and migrated to Melbourne in the P. & O. steamship *Chusan*, the first vessel of that company that was sent to Australia; Pasco was given a free passage in her because as far back as 1846 he had suggested the extension Australia-wards of the mail-services to the East Indies. In September 1852, not long after his arrival in Melbourne, Latrobe made him water-police-magistrate at Williamstown; he therefore retired from the navy, with the rank of commander, and settled at Melbourne, where he died on 18 February 1898.

His book *A Roving Commission*, published in Melbourne in 1897, is a brisk narrative of his long sea-services, and contains an interesting account of early days in what is now the Northern Territory.

W.J.

Pasley, Charles (1824-1890), eldest son of the Sir C. W. Pasley who was one of the greatest engineer officers of the 19th century, was born at Chatham on 14 November 1824, educated at the

Royal Military Academy, Woolwich, and given a commission in the Royal Engineers on 20 December 1843 (lieutenant, 1846; captain, 1854; brevet-major, 1862; lieutenant-colonel, 1867; colonel, 1872; major-general, 1881). He was employed on survey work in Canada (1848-9) and in the superintendence of public works at Bermuda (1849-50), and in 1853 was appointed colonial engineer of Victoria—a post which, he soon found, included the duties of supervising building- and road-construction. In 1854 he was given a seat in the legislative council; in December he acted as aide-de-camp to Captain Thomas at the Eureka Stockade. When Victoria was given self-government in 1855, Pasley was taken into the Haines ministry as commissioner for public works, and was responsible for the building of government house and the houses of parliament. He left office on the defeat of the ministry in March 1857, but continued to render public service as trustee for the Mount Alexander railway and as member of a commission on colonial defence. In May 1860 he resigned all his positions and intended to return to England, but, hearing that the war in New Zealand was going badly, offered his services to General Pratt (who was taking as reinforcements to New Zealand all the British troops he could collect in Australia), and distinguished himself in trench-fighting against the Kaihihi pa. Invalided back to Melbourne in November 1860 and to England in May 1861, he was made engineer officer commanding at Gravesend, in 1865 was charged with the extension of Chatham dockyard, and in 1873 was made director of engineering and architecture to the admiralty. From this post he retired in 1882, and died at Chiswick on 11 November 1890.

His connection with Victoria had not ended in 1860. From 1864 to 1868 he was special agent in London for the colony, and was largely responsible for the acquirement of the *Nelson* and *Cerberus* (see NAVAL DEFENCE). From 1880 to 1882 he was acting agent-general for the colony. His other services to the Empire include a report on warship design (1871), another on improvements to the harbour of Alexandria (1881), and the designing of Devonport and Haulbowline dockyards, the barracks and college at Keyham, and the college at Greenwich Hospital. (C.B., 1880.)

Paspalum, a fodder grass (*Paspalum dilatatum*) introduced by Baron von Mueller in 1891 from South America. An ounce of seed which he sent to the then director of agriculture in New South Wales was divided between dairy-farmers at Wollongbar and along the Richmond River, and from this beginning spread till it covers more than a million acres and has assured the prosperity of dairy-farming on the rivers of the State's northern coast. This result is due to its extraordinary tenacity of life and power of spreading from the roots. As the forests of those river-valleys were destroyed, *Paspalum* was the only grass capable of competing with the numerous and aggressive weeds that strove to take their place. For many years the grass was a poor seeder and was usually propagated by roots, but as it became acclimatized it began to grow well from seed also; it has become a grave pest in the gardens of one of the northern suburbs of Sydney, where it was introduced by a resident who kept a couple of cows. In the dairying districts, of course, it is controlled by steady feeding-off before the seed can be formed.

Its principal characteristics are its perennial habit, succulent wide leaves, rapid summer growth, ability to spread, palatableness when not in seed, adaptability to growth side by side with white clover, susceptibility to frosts and cold climates, and heavy carrying qualities. It should not be grown near lucerne land, as it will quickly spread there, and is extremely difficult to eradicate. If used for hay or silage, it should be cut before it comes into flower. *Paspalum* paddocks should be ploughed up every few years, otherwise the grass becomes impoverished. It is well suited to the coastal districts of Queensland and New South Wales, and to warmer and moist localities inland, particularly to irrigation areas; in these, however, care must be taken to prevent it from becoming a pest in orchards. See GRASSES.

E.B.

Pastoral Industry, THE, began in Australia with the first introduction of plants and seeds, cattle, sheep and a miscellaneous collection of horses, pigs, barn-door fowls, and turkeys (see FIRST FLEET and PHILLIP, ARTHUR). Among the first arrivals were one farmer and two persons with a slight knowledge of farming. All stock was the property of the government, which distributed to each married settler, each settler from the Marines, and each settler from the *Sirius* (q.v.), one ewe and as many she-goats as could be spared. Many of the sheep died soon after landing, in consequence, it was said, of the indigenous grasses being unsuitable. Some were killed by native dogs, and others were lost in various ways until only one remained. To add to these misfortunes the cattle strayed and were lost (see CATTLE); when all hope of recovering them had been abandoned, the remaining cow, having become wild and dangerous, was killed and eaten. More stock arrived from the Cape in 1791, and early in 1792 Governor Phillip urged the necessity for a further supply; some stock was imported from Bengal, but it proved unsuitable for breeding purposes. As soon as Phillip left the colony (11 December 1792) most of the stock was offered for sale, and, but that the officers purchased it, it would soon have been all killed off. Lieutenant-governor Grose (q.v.) encouraged the officers to preserve and breed from it by allotting 100 acres to those who applied for them. In January 1793 additions to the stock arrived, and in the following January the colonists had fresh meat for the third time since the founding of the colony. In 1794 the settlement at the Hawkesbury River was founded by J. Rous and C. Williams and about 20 others who had received grants of sheep and cattle. Special services were rewarded in this way; John Squires received a cow for growing hops, and John Macarthur (q.v.) 100 ewes as a reward for his enterprise and industry. By 1795 remarkable progress had been made by Macarthur on his farm at Parramatta, Richard Johnson (q.v.) was farming 600 acres, and Samuel Marsden (q.v.) was reckoned the most efficient farmer in the colony. In 1802 Governor King, wishing to encourage the 'men on the land,' introduced a system of premiums; three ewes were given to the man who raised the most maize or wheat, or bred the greatest number of swine, the object being to put the acquirement of stock within the reach of the industrious. Special inducements were held out by the English government for free settlers to migrate to New South Wales. By 1804 the

limits of the settlement entailed hardship on the smaller settlers who had not enough land on which to depasture their flocks, and in August, to remedy this, King granted a portion of the crown lands adjacent to the farming districts, and set out the boundaries of commons at what are now Pitt Town, Richmond, Windsor, Prospect, Baulkham Hills, and Field of Mars.

By this time there was a feeling in England that the government was plunging too deeply into affairs that properly belonged to the individual citizen. Lord Hobart issued instructions to King to diminish the amount of cultivation carried on by the government. This involved a decline in the number of stock bred and kept, and King mildly protested, representing that the state of the colony demanded government interference; stock-raising was continued for many years by the government, which further encouraged the industry by being the chief purchaser of cattle for the government stores. In the meantime Macarthur had persuaded the home government to make him a large grant of land for the purpose of raising sheep. He was given 5000 acres of the best land then known in the colony (now Camden Park) where he built up a fine flock of merinos (see SHEEP and WOOL).

NEW SOUTH WALES STOCK RETURNS, 1788-1925.

Date.	Horses.	Cattle.	Sheep	Goats.	Swine.	Acres under Crop.
1788 (May)...	7	7	29	19	74	8
1791 (Nov.)	4	18	57	...	37	213
1794 (July)	20	40	526	522	...	1,703
1795 (June)	49	176	832	985	...	2,721
1796 (Sept.)	57	227	1,531	1,427	1,869	5,419
1797 (Aug.)	84	327	2,447	2,276	4,247	4,934
1798 ,,	117	421	3,902	2,667	2,867	6,192
1799 ,,	138	709	5,103	2,763	3,459	8,750
1800 ,,	203	1,044	6,124	2,182	4,026	7,595
1801 (June)	241	1,242	7,046	1,240	4,766	9,197
1802 (Aug.)	293	1,856	8,661	1,146	5,233	8,344
1803 (July)	258	2,450	11,275	1,738	9,105	12,408
1804 ,,	434	3,264	16,501	2,080	14,308	13,880
1805 (Aug.)	517	4,325	20,617	3,810	23,000	13,650
1806 ,,	552	5,286	21,457	2,258	6,988	11,689
1807 ,,	690	6,643	25,260	3,328	9,010	13,666
1808 (Nov.)	940	9,004	33,258	2,975	19,368	11,864
1810 (Feb.)	1,114	11,267	32,818	1,736	8,992	7,615
1821	4,564	102,939	290,158	...	33,906	32,267
1830	12,179	262,868	536,391	...	...	...
1850	132,437	1,738,965	7,366,895	...	65,510	...
1860	251,497	2,408,586	6,119,163	...	...	260,798
1870	337,597	2,195,096	16,308,585	...	213,193	426,976
1880	395,984	2,580,040	35,398,121	...	...	629,180
1890	444,163	2,091,229	55,986,431	...	253,189	852,704
1900	481,417	1,983,116	40,020,506	...	265,730	2,445,564
1910	650,636	3,140,307	45,560,969	...	321,632	3,386,017
1920	663,178	3,375,267	33,851,828	...	306,253	4,467,109
1925	647,503	2,876,254	42,925,177	26,313	339,669	4,914,485

The acreage for 1810 does not include the land under wheat.

Horses had multiplied greatly; by 1806 they numbered 552, of which 305 were mares. These were originally brought from the Cape and India, except one horse and one mare which came out from England in the *Buffalo* in 1802. The breed had improved, and they were bred in the bush at small cost. By 1810 the pastoral industry had again outgrown the settlement's boundaries, and matters were made worse by the droughts which occurred in 1812 and 1813. The position was acute when Gregory Blaxland, William Lawson, and William Charles Wentworth (see EXPLORATION BY LAND) solved the problem by finding a pass over the Blue Mountains (q.v.) to the rich plains beyond. Macquarie sent G. W. Evans with a party to examine the new country, and, acting on his report, employed William Cox to construct a road to give access to it. Early in 1815 Macquarie fixed the site of Bathurst, making large grants of land to all concerned in the finding and exploration of the newly discovered territory. Pastoralists immediately drove their flocks to the new land, and Macquarie, by giving them every encouragement, brought about a great increase in the stock of the colony and in the area of land cleared and tilled. Between 1815 and 1825 there arose a new type of pastoralist—the squatter.

John Macarthur, jun., made, and Commissioner Bigge (q.v.) supported, the proposal to form a joint-stock company (see AUSTRALIAN AGRICULTURAL COMPANY) that would seek unlimited range for flocks in the interior, 'not approaching nearer to the settled estates than five miles.' Bigge's reports were published in 1822-3, and an ever-increasing stream of superior immigrants began to come out, and, flowing over the boundaries of the settlement, gradually took possession of that greater New South Wales which lay outside the pale. The squatters had no little difficulty in gaining a footing; the British government would only allow approved settlers to migrate, and Macquarie permitted no one to depasture in new country without special authority from himself. Sir Thomas Brisbane, however, freely granted to reputable persons licences that were revocable at six months notice; the licence showed that, in his opinion, the holder was reputable enough to live beyond the recognized boundaries of settlement. The system was developed later by Sir Richard Bourke; in common with previous governors, he held that the land beyond the recognized boundaries was open to all to depasture on until it was required for the settlement itself. These licences cost the squatters £10 a year, together with a yearly assessment on each head of sheep, cattle, or horses; this revenue provided for the maintenance of a border police for the squatting districts. In 1846, when it was attempted to re-enact measures to restrain unauthorized occupation, strenuous opposition was made by Robert Lowe (see SHERBROOKE, LORD), Dr. Lang, James Macarthur, W. C. Wentworth, and Richard Windeyer, on whose motion the proposal was thrown out by the council; it was not brought forward again until Sir Charles FitzRoy's time. When flocks were being driven far to the north of the 26th degree, Fitzroy endeavoured to prevent the occupation of the country 'by private enterprise in opposition to the rights of the government;' but the squatters outside the pale united with those within and won a legal triumph. In the meantime the Australian Agricultural Company was established and landed its first shipment on 11 December 1825. At the beginning of 1846 the number of cattle within the pale was 417,000, and of sheep 1,891,000; the cattle without the pale numbered 698,000, and the sheep 2,518,000. The disparity was still more sharply accentuated in the Port Phillip district. There, only 30,000 cattle and 351,000 sheep were within the settlement, while 200,973 cattle and 1,430,914 sheep grazed outside it; the disproportion was still

greater in what was soon to become Queensland, where most of the grazing-runs lay outside the settled districts. In 1884 only 334 runs, containing 7,440,000 acres, were within the settled districts, whereas 9208 runs, held by a much smaller number of people, contained 308,669,026 acres. Following the extensive operations of the Agricultural Company in 1826, there came a sheep-and-cattle mania, when all sorts of people bought indiscriminately, 'outbidding each other in the most determined manner for every scabbed sheep, scarecrow horse, or buffalo cow that was offered for sale in the colony.' Agriculture was neglected, and when a severe drought occurred many were ruined. Since that time the pastoral industry has been carried on by men who have had some training, and rash speculation has largely ceased. In 1925 Australia produced one-third of the world's wool.

The 1920 and 1925 figures for the Federal Capital Territory are included in the New South Wales totals. In normal years between 130,000 and 160,000 sheep, about 7000 cattle, 1400 horses, and 400 pigs are depastured there.

Tasmania.—The industry began with the landing of stock by Lieutenant John Bowen (q.v.) at Risdon Cove on 27 September 1803. There were 9 cattle and 25 sheep owned by the government, a mare belonging to the commandant, a cow belonging to the doctor, and the officers and free-settlers Birt and Clark possessed 7 sheep, 8 goats, and 38 swine. After Lieutenant-governor Collins founded Hobart in 1804 the live stock was numbered at 20 head of cattle, 60 sheep, some pigs, goats, and poultry. The settlement at Port Dalrymple (see LAUNCESTON) was more successful. Colonel Paterson arrived in November 1804 and brought 1 horse, 4 head of cattle, 3 sheep, and 15 swine. To them were added from the *Buffalo* in March 1805 2 horses, 8 cattle, and 135 sheep. In the following month a shipment of 612 cows with 10 calves—the survivors of 910 shipped at Calcutta—were landed at the Outer Cove in charge of Ensign Piper; only 251 lived till the following spring. These were removed to Point Rapid, and later to the more fertile plains of the North Esk, since Yorkton had been found wholly unsuitable for a settlement. In 1813 the industry was retarded by the depredations of armed bushrangers (see BUSHRANGING), who pillaged, burnt, and slaughtered wholesale. Lieutenant-governor Sorell, who arrived in April 1817, did much to encourage the industry by granting land to new settlers in proportion to the capital they brought, and by guaranteeing 10s. a bushel for all wheat grown and 6d. per lb. for meat. The grantees spread themselves over the broad plains of the interior, and the finest parts of the island were alienated. The first stock was mainly of the Bengal breed, but the quality of sheep was improved in 1820 by the importation of 300 lambs from John Macarthur's flocks. In 1818 wool from Tasmania was considered worthless, but in 1819 the colonial government bought several tons at 3d. per lb., and the captain of an English trader accepted some in exchange for merchandise. In 1822 Henry Hopkins offered a cash prize for wool and bought 12 bales at 4d. per lb., the entire export of the colony for that year; it was sold in London at 7d. per lb. In 1823 550 bales were exported in one vessel. In 1821, when Governor Macquarie visited the colony, there were 15,000 acres of cultivated land, 35,000 head of horned cattle, 170,000 sheep, 550 horses, and 5000 swine.

In 1825 the Van Diemen's Land Company was formed to improve the quality of Australian flocks and so help to relieve Great Britain from dependence on foreign wool (see VAN DIEMEN'S LAND COMPANY). The company was responsible for introducing valuable stock into the colony, as were several settlers, notably Patrick Wood, who imported the Fifeshire breed, and Captain Watson, who brought the Normandy breed. Other immigrants brought Devon, Hereford, Durham, Holstein, and Fifeshire cattle in considerable numbers, as well as draught-horses and ponies. The foremost importers of stock were William Bryan, who had the best Devons, B. B. Thomas, Thomas Anstey, and Captain Wood. The importations from New South Wales were brought by W. R. Loane, Edward Lloyd, Colonel Geils, and Captain Barclay. In 1826 George Hobbler settled close to Launceston, bringing with him a few sheep and a Devon cow; many of the pure Devons now in Tasmania are descended from his famous 'Fair Maid.' P. Willis of Wanstead brought out good shorthorns and Captain Langdon some high-bred Devons.

Horses were first imported from New South Wales, but they were not of the best. About the end of the twenties some were imported from England and India, and the breed improved. A race-course formed in the early thirties helped considerably to better the breed of horses, but breeders for the most part gave more attention to draught-horses than to race-horses. The discovery of gold in the other colonies threw back the industry, for labour became scarce. After the rush was over, things returned to normal and the industry again flourished. The climate of Tasmania makes it highly suitable for stock-raising, and for many years Australia has imported stock for stud purposes from the island.

TASMANIA STOCK RETURNS, 1816-1925.

Year.	Horses.	Cattle.	Sheep.
1816	34 (*a*)	1,956 (*a*)	20,501 (*a*)
1817	188 (*b*)	9,868 (*b*)	76,991 (*b*)
1818	267	12,355	127,883
1819	363	23,124	172,128
1820	111	6,889	42,003
1821	550	34,790	182,468
1822–6		No returns.	
1827	1,596	67,190	316,276
1828	2,034	84,476	553,698
1829	2,514	109,101	637,141
1830	3,387	85,942	680,740
1835	6,449	82,217	824,256
1840	11,850	92,101	1,089,987
1845	14,824	76,417	1,253,481
1850	18,391	82,761	1,822,320
1855	18,358	110,304	1,835,902
1860	21,034	83,366	1,700,930
1870	22,679	101,459	1,349,775
1880	25,267	127,187	1,796,715
1890	31,165	162,440	1,619,256
1900	31,607	165,516	1,683,956
1910	41,388	201,854	1,788,310
1920	39,117	208,202	1,570,832
1925	37,091	225,740	1,614,085

(*a*) County Cornwall only. (*b*) County Buckingham only.

Western Australia.—In 1829 Captains Fremantle and Stirling (q.v.) brought to the new colony 200 sheep, 51 head of cattle, 33 horses, and some pigs and poultry. In the latter part of 1829 and in 1830-1 a number of sheep were imported from Tasmania, the first lot being brought by T. Henty. About 3500 sheep in all were brought, but as there was thought to be little land suitable for grazing, nearly all were killed to supply the war-ships. At the same time Lord and Bryant imported 60 head of cattle, some of which strayed into the bush

and formed wild herds; others were killed. In January 1830 the cattle numbered was 204, horses 57, sheep 1096, and pigs 106. The Swan River was the first part of the colony to be taken up, and the stock then spread down towards King George's Sound and Cape Leeuwin. Wooded land proved unfit for pasturing; some animals were lost in the thickets or died from eating poisonous plants, and the lack of water was a serious handicap. Gradually the depasturing circle was extended, and the neighbourhood of the Irwin River in the East Victoria district became noted for its cattle. Among the first farmers to settle on the Swan River were Joseph Hardy from Lincolnshire and B. Clarkson from Yorkshire, who as early as 1833 had bred a race of tall handsome horses from a large breed which they had brought out and crossed with Cape mares. A number of farmers were becoming prosperous, and by 1835 the pastoral industry was well established. On 23 August 1835 the Western Australian Association was formed 'for the purpose of watching over the interests of the settlement known as the Swan River Colony,' and at the end of the year George Moore, advocate-general, reported that there were 1000 acres under wheat, 5000 sheep, and an export of 5 tons of wool. In 1837 John Hassall, on his way to England, was so impressed with the possibilities of the colony that he brought from London a shipment of merchandise which he sold in Launceston; proceeding to Sydney he chartered the *China* which he stocked with sheep, cattle, horses, other live stock, provisions, implements, etc. and sailed for King George's Sound, where he landed on 1 March 1840. He settled at Kalgan and attracted a number of new settlers round him.

Sheep and cattle were landed at various times from the *Lion, Thames, Bussorah,* and *William,* but of the 10,641 sheep brought in these vessels not more than 1200 to 1500 reached the settlers; many died after landing, or were sent to the butcher. On 6 November 1834 the first cattle-show was held, and an annual fair was begun at Guildford in 1836. During 1837 'remission tickets' were issued; these gave the occupiers of land the right to render back to the government two-thirds of the grant of land in their possession and to choose one-third the number of acres in another part of the colony.

In 1841 the Western Australian Company purposed buying large tracts of land at Australind near Leschenault and reselling it in farms of 100 acres. The scheme failed because at this time New Zealand and South Australia were attracting settlers. Labour became scarce, industries flagged, and a period of depression fell on the colony. With the sending of consignments of convicts cheap labour became available and a great impetus was given to the pastoral industry during the ensuing ten years. In September 1844 the first exported cattle were sent to the Isle of France in the *Unicorn,* and in October 1849 a Horse-rearing Company was established. The first horses were exported to India in 1851. Communication with the outside world was established by the Australian Mail Company on 20 August 1852, and the industry continued to progress. Local agricultural societies sprang up, the stock became much improved, explorations were made, and fresh country opened up. The first shipment of wool from the north-west arrived at Fremantle in 1864. During the seventies John and Alexander Forrest (q.v.) made expeditions across the southern portion of the colony and opened up fresh pastoral areas (see EXPLORATION BY LAND).

WESTERN AUSTRALIA STOCK RETURNS, 1834-1925.

Date.	Horses.	Cattle.	Sheep.
1834	162	500	3,545
1835	167	646	5,138
1836	191	728	8,119
1837	254	837	10,271
1838	271	1,052	15,590
1839	367	1,308	21,038
1840	506	2,318	30,961
1842	1,069	4,122	60,380
1843	1,202	4,861	76,191
1844	1,231	5,376	86,482
1845	1,430	6,508	95,681
1846	1,727	7,583	102,084
1847	1,841	8,699	114,124
1848	2,095	10,919	141,123
1860	9,555	32,476	260,136
1870	22,174	45,213	608,892
1880	34,568	63,719	1,231,717
1890	44,384	130,970	2,524,913
1900	68,253	338,590	2,434,311
1910	134,114	825,040	5,158,516
1920	178,664	849,803	6,532,965
1925	175,116	891,564	6,396,564

Victoria.—The first stock was brought by Thomas Henty from Launceston in the ship *Thistle,* which anchored in Portland Bay on 19 November 1834. A month later the *Thistle* brought his son Francis Henty with more sheep and cattle. Three other sons joined the firm a little later, and until 1842 worked in a fairly prosperous partnership in grazing, whaling, and wool-growing. In the meantime John Batman (q.v.) and John Pascoe Fawkner (q.v.) had settled at Port Phillip with herds and flocks, and the Port Phillip Association had been formed in Tasmania, each member being bound to bring over 1000 sheep within a year. On 26 October 1835 500 sheep and 50 Hereford cattle were landed on the scrubby shore where Williamstown now stands, and, within a radius of ten miles, by January 1836 there had been formed three stations, named Conolly, Swanston, and Solomon after the proprietors. The total white population of the Yarra settlement at this time was under 50, but they had over 100 head of cattle, 1400 sheep, 6 horses, and a stock of poultry. In 1836 John Aitken landed from Tasmania with stock, drove it across country, and formed a station about half-way between Sunbury and Gisborne. In the eyes of the authorities all these settlers were trespassers, and Governor Bourke sent George Stewart to report on the 'invasions.' Stewart was impressed with the importance of the new territory and pledged himself to further the settlers' claims for recognition. Bourke applied for authority to countenance the settlement, and received it; on 9 September 1836 he issued a proclamation notifying the authorization of the settlement at Port Phillip under the same crown lands regulations that were in force in other parts of New South Wales. At the same time Sir T. L. Mitchell reported favourably on the land in the western district, and a number of New South Wales squatters moved their flocks there. In February 1838 another migration took place, and in August 1840 it was estimated that 20,000 cattle were on the road between Yass and Melbourne. Many settlers who had formed stations on the upper Murray in 1836-8 moved on to the Port Phillip district, and over 100,000 sheep crossed the Murrumbidgee in three months. Stockowners flowed in from Tasmania, and the ripely experienced squatters soon brought the country to a producing stage that it otherwise might have taken a quarter of a century to reach. Within two years 250,000 sheep had been transported, about 50 stations formed, and the

greater part of the western district taken up. At first Geelong was the centre of settlement, and in 1837 about 30 stations were formed along the banks of the Moorabool, Barwon, and Leigh rivers, but a little later Melbourne and Portland became points of further settlement. In 1837 four Tasmanian squatters occupied the Colac country, finding one pioneer already there. Early in 1838 eight more took up unoccupied land round about Lake Colac, and Joseph Hawdon and John Hepburn led an expedition from New South Wales and formed near the Yarra the first cattle-station. In the same year Captain Howey took up a station near Gisborne, the first run connecting the squatters from Sydney with those from Tasmania, and in 1839-40 large numbers of stations were formed. Many of the pioneers were the discoverers of the land they afterwards occupied.

In 1838 G. D. Mercer and two others set out beyond the boundaries of settlement and, following up the creeks, discovered the country now occupied by four stations, and took up runs for themselves. A squatter and an overseer discovered the Mount Talbot country, one of the finest runs in the Port Phillip district. In 1847 a run was formed on the edge of the sandy desert forming the boundary of Victoria and South Australia, but for the most part only the richer parts of the country were at this time settled on by the graziers. When 'boiling-down' came into practice, and lean stock became valuable, the poorer country was occupied, and the northern plains and the Wimmera were settled. In 1839 Gippsland was discovered by A. McMillan, who returned in 1840 to form a station. It was 'rediscovered' by Count P. E. de Strzelecki (q.v.) whose glowing accounts of it soon brought 15 licensed and 7 unlicensed squatters from New South Wales, where at this time there was a drought. In 1842, owing to rash speculation, a depression fell upon the settlement (see BANKING) and the price of stock fell alarmingly. Henry O'Brien of Yass suggested the boiling-down of carcases for tallow; depreciation was arrested, and in a few years passed away.

It has been estimated that in 1856 the approximate area of the squatters' runs in Victoria was as follows:—

District.	Approximate Acreage.
Wimmera	9,358,849
Murray	6,132,726
Gippsland	1,845,232
Western Port	6,909,723
Portland Bay	7,103,306
Grant and Bourke	117,980
Total	31,467,816

Under the licences on which the land was held the squatters had certain pre-emptive rights, and up to 1856 they had exercised that right of purchase to the following extent:—

County.	Extent. acres.	Amount. £.
Anglesey	7,680	7,944
Bourke	7,360	8,816
Dalhousie	7,316	7,874
Dundas	10,160	10,555
Evelyn	3,560	3,560
Follett	2,240	2,240
Grant	17,363	18,327
Grenville	16,209	16,296
Hampden	16,800	16,912
Heytesbury	1,920	1,920
Mornington	14,156	14,431
Normanby	21,018	22,096
Polwarth	6,539	7,454
Ripon	13,760	14,011
Talbot	12,800	14,064
Villiers	20,320	20,505
Unnamed	98,520	99,783
Total	277,721	286,788

Following is the value in pounds sterling of the exports of wool and tallow, hides and skins from Victoria prior to 1859:—

Year.	Wool.	Tallow.	Hide and Skins.
	£	£	£
1837	11,369	28	22
1838	21,631	489	117
1839	45,226	396	249
1840	67,902	953	251
1841	85,735	786	561
1842	151,446	975	801
1843	201,383	1,700	743
1844	174,044	13,907	989
1845	396,537	12,267	1,913
1846	351,441	3,049	2,256
1847	565,805	15,802	3,267
1848	556,521	37,968	2,066
1849	574,594	100,261	2,184
1850	826,190	132,863	5,196
1851	734,618	123,203	7,414
1852	1,062,787	60,261	13,306
1853	1,651,871	13,252	11,811
1854	1,618,114	22,750	29,465
1855	1,405,659	29,117	41,871
1856	1,506,613	35,980	72,103
1857	1,335,642	62,363	191,828
1858	1,678,290	43,987	166,527
1859	1,756,950	10,354	172,446
	£16,780,368	£722,711	£727,386

The following gives the numbers of stock in Victoria in various years, commencing with the first available returns:—

VICTORIA STOCK RETURNS, 1836-1925.

Date.	Horses.	Cattle.	Sheep.
1836 (May)	57	100	26,000
1836 (Nov.)	75	155	41,332
1838 (Sept.)	524	13,272	310,946
1841 (Jan.)	2,372	50,837	782,283
1843 ,,	4,065	100,792	1,404,333
1844 ,,	6,278	167,156	1,602,798
1845 ,,	7,076	187,873	1,860,912
1846 ,,	9,289	231,602	1,792,527
1847 ,,	11,400	290,439	2,996,992
1848 ,,	13,292	322,824	4,164,203
1849 ,,	16,495	386,688	5,130,277
1850 ,,	16,733	346,562	5,318,046
1851 ,,	21,219	378,806	6,032,783
1852 ,,	22,086	390,923	6,589,923
1852 (Dec.)	34,021	431,380	6,551,506
1853 ,,	15,166	410,139	5,594,220
1854 ,,	27,038	481,040	5,332,007
1856 (Jan.)	33,430	534,113	4,577,872
1857 (Mar.)	47,832	646,613	4,641,548
1858 ,,	55,683	614,537	4,766,022
1859	68,323	699,330	5,578,413
1860	76,536	722,332	5,780,896
1870	167,220	721,096	10,761,887
1880	275,516	1,286,267	10,360,285
1890	436,459	1,782,978	12,692,843
1900	392,237	1,602,384	10,841,790
1910	472,080	1,547,569	12,882,665
1920	487,503	1,575,159	12,171,084
1925 (Mar.)	473,236	1,605,554	12,649,898

South Australia.—The first stock was landed in 1836 from the ship *John Pirie* by the South Australian Company (see SOUTH AUSTRALIA). It comprised six rams of merino and Leicester breed, two cows, and a few goats. In the same year 70 sheep, and a mare for the use of the manager of the company, were brought from Tasmania. The stock was grazed on the plains round Glenelg, and for a few years certain localities round Adelaide were known as No. 1 sheep station, No. 2 sheep station, etc. In 1837 more stock arrived from the Cape, Tasmania, and elsewhere, and the commissioners made land available on lease at 10s. a square mile, two square miles being allowed for each country section. On 3 April 1838 Joseph Haw-

don and Charles Bonney brought overland from New South Wales 325 bullocks, heifers, cows, and horses. Three months later E. J. Eyre (q.v.) brought 300 head of cattle, and in 1838 a third party under Charles Sturt (q.v.) arrived with 400 head of stock. In addition large numbers of sheep and cattle were sent by ship from New South Wales and Tasmania. To promote further importations a 'Joint Stock Sheep and Cattle Company' was formed with a capital of £20,000, and large purchases were made. In May 1838 the first four bales of wool were exported to England. In January 1839 the first 'special survey' of 4000 acres was applied for by Frederick H. Dutton, for himself, D. Macfarlane, and B. T. Finniss (q.v.), colonists of New South Wales, and in the same year Stephen King, one of the pioneers of the Gawler district, arrived. More stock was brought overland by Eyre in February and later by Captain Hart and J. S. Pullen from Portland Bay. In March one Wetherall arrived with 979 head of cattle and in April Finniss brought 700 head and 2500 sheep. At the end of the year, the Society for the Protection of Flocks and Herds was established.

Besides sheep and cattle, horses were brought in considerable numbers, the New South Wales stock-horse being considered the most suitable. The majority of the draught-horses came from Tasmania, a few thoroughbreds from England, some Arabs from the East Indies, and a number of small but hardy ponies from Lombok and Timor. Some settlers directed their attention to horse-breeding as well as cattle-breeding. J. B. Hack of Mount Barker had 120 horses and 1000 cattle in 1841. At the end of this year the South Australian Company had 20,000 sheep and was considered the largest owner in the colony; F. S. Dutton (q.v.) and C. H. Bagot (q.v.) had 11,000, and Duncan Macfarlane at Mount Barker and George Anstey at Parra had 10,000 each. The cattle held by the company numbered 1160 head; but the largest cattle-owners were Frew and Rankin, who had 1758 head on their station at Strathalbyn. In 1843 boiling-down was introduced and the manufacture of soap and candles was begun on a large scale. As sheep were a glut in the market at the time, thousands were boiled down for their tallow. While the South Australian Company had encouraged closer settlement and had imported much pure-bred stock which improved the industry and the conditions of the settlers generally, it was done with much loss to its own finances. The depression of the meat trade, at its lowest in 1848, was a severe blow, and in 1850 the company disposed of the whole of its flocks and cattle at Bremer and Mount Gambier stations as well as 472 acres at Mount Gambier. The discovery of gold (q.v.) in Victoria revolutionized the meat trade and squatting prospects; mutton and beef advanced to three and four times their previous value. For some years the prices kept up, but another depression in 1869 brought about the resumption of boiling-down. The establishment of the frozen-meat trade finally prevented sheep and cattle from becoming a drug in the market again.

Queensland.—The industry was established when Patrick Leslie in 1840 removed his stock from the New England district of New South Wales to the Darling Downs after exploring that country. Accompanied by 22 ticket-of-leave men, he drove his stock to the Condamine River and formed his stations and out-stations.

SOUTH AUSTRALIA STOCK RETURNS, 1838-1925.

Year.	Horses.	Cattle.	Sheep.
1838	480	2,500	28,000
1839	800	7,600	108,700
1840	1,060	15,100	200,160
1841	390	.....	.....
1842	1,560	26,000	300,000
1843	1,576	29,000	331,000
1844	.....	22,711	355,689
1845	.....	26,146	480,669
1846	2,000	56,986	681,374
1847	.....	56,375	784,811
1848	.....	55,083	838,394
1849	.....	53,661	884,078
1850	6,488	60,034	984,199
1854	10,184	74,220	1,768,724
1856	22,260	272,746	1,962,460
1857	26,220	310,400	2,075,805
1858	34,629	.....	.....
1859	40,471	.....	.....
1860	49,399	278,265	2,824,811
1870	83,744	136,832	4,400,655
1880	148,219	283,315	6,443,904
1890	187,686	359,938	7,004,642
1900	166,790	214,761	5,235,220
1910	249,326	384,862	6,267,447
1920	268,187	376,399	6,359,944
1925	255,022	400,423	6,359,240

Later, finding he had taken up too much country, he sold parts of it to various individuals and companies. One man is said to have been there before him, but Leslie is always reckoned the pioneer squatter of Queensland. In January 1840 John Campbell set out with two servants in search of a run and settled on the Gwydir, but his right was disputed. He then took up land at Bebo, and his men built huts while he made his cattle-camps on the other side of the river, becoming by accident the first stock-owner in Queensland, two months before Patrick Leslie passed the station on his way to the Darling Downs. David Colin McConnel followed Leslie's tracks as far as the Severn and then diverged, passing by Tenterfield and Stanthorpe. Crossing the Great Dividing Range, he settled on Cessbrook Creek, a tributary of the upper Brisbane River, in 1841. He was the first to settle with stock on a run east of the main range in Queensland. He brought pedigree shorthorn bulls imported by the Australian Agricultural Company, and, later, himself imported others from England. The herd thus bred still exists. Other squatters speedily followed. In 1841 a succession of pioneers settled on the Darling Downs. Joseph King and James Sibley formed King's Creek station on an affluent of the Condamine; Arthur Hodgson and Gilbert Elliott next settled at Etonvale; Henry Hughes and F. N. Isaac took up Gowrie; Henry S. Russell, Cecil Plains; the Gores occupied Yandalla and Tummaville; and Henry Dennis took up Jondaryan. By 1844 30 stations had been formed on the Darling Downs. All through the forties, fifties, and early sixties, successive waves of occupation flowed over the Queensland border, passed the existing stations, and settled on the great tracts of unoccupied land to the north. This necessitated the opening of fresh ports farther north on the eastern coast and in the Gulf of Carpentaria. A dozen pioneers settled on the lower Brisbane, although it was forbidden until May 1842 by the government's prohibition to settle without licence within 50 miles of the penal establishment at Moreton Bay.

After the Darling Downs, the northern and western watersheds received the pioneers. The Burnett was the first to be settled, the Halys being attracted to its upper reaches, and John

Eales, from Hunter River, settled at Wide Bay. Richard Jones, from Sydney, was the first to pass the range nearer Nanango, and others occupied land on the middle and upper Burnett. In 1853 the Archer family, pioneers of the Burnett district, set out to look for fresh country. Starting from Eidsvold, they passed by Rannes, the outmost station in that direction, occupied by the Leith-Hays, and came upon Gracemere Lake. Pushing on, they discovered and named the Fitzroy River and returned; two years later they established their head-station at Gracemere Lake. Others followed their lead; the Landsboroughs of Raglan settled near Gladstone, and John Young led the way northward and opened up the country between Gladstone and Rockhampton. After Leichhardt made his discoveries (see EXPLORATION BY LAND) pioneers pushed out towards Peak Downs. Among the first were Connor, Fitts, and B. B. Henning. William Stewart in 1861 overlanded from Victoria, and brought the first mob of cattle for two new stations on the Thomson. Both north and west, runs were taken up with astonishing rapidity. James Gibson was the pioneer in the Burke district and the first on the Flinders, where he stocked a number of runs. In 1863 James Rule and Dyson Lacy made a station at Aramac Creek, and in 1864 N. Buchanan crossed the Albert and settled at Beame's Brook station. Others followed on Gregory Downs, Donor's Hill, and in 1865 Edward Palmer, author of *Early Days in North Queensland* (Sydney, 1903), settled at Conobie. Captain John Mackay set out from Armidale in New South Wales in 1860, tracked the Pioneer River to the coast and secured the fertile valley it watered. In the following year he drove his cattle, horses, and bullock-teams overland and in 1862 formed his station.

QUEENSLAND STOCK RETURNS, 1839-1925.

Year.	Horses.	Cattle.	Sheep.
1839 (Government stock)	.....	900	4,000
1844	660	13,295	184,651
1846 (Government stock)	8	1,442	3,468
1847	2,000	37,000 (odd)	536,580
1849	2,812	72,096	1,077,983
1859 .....(about)	20,000	300,000	2,000,000
1860	23,504	432,890	3,449,350
1870	83,358	1,076,630	8,163,818
1880	179,152	3,162,752	6,935,967
1890	365,812	5,558,264	18,007,234
1900	456,788	4,078,191	10,339,185
1910	593,813	5,131,699	20,331,838
1920	741,024	6,455,067	17,404,840
1925	660,093	6,454,653	19,082,252

The Northern Territory was settled from Queensland, the first overlanders being D'Arcy Uhr with cattle, and Dillon Cox with horses, both in 1872. Mobs of cattle followed these pioneers, and by 1877 more than half the suitable land was taken up, though many of the runs were left undeveloped for a number of years. As pastoral occupation advanced, pastoral associations similar to that of the Musgrave Range took up immense areas all over the Territory. All the pastoral land from Port Darwin southeast to the Roper River and the Gulf country was taken up and stocked. Some runs were 6000 miles square and carried 2000 head of 'fats.' Fat cattle were shipped in the eighties from Glencoe to Batavia and Singapore.

The following table gives the numbers of stock in the Northern Territory in various years, commencing with the first available returns:—

NORTHERN TERRITORY STOCK RETURNS, 1880-1925.

Year.	Horses.	Cattle.	Sheep.
1880	2,372	19,720	9,318
1890	11,919	214,094	45,902
1900	12,562	257,667	48,027
1910	24,509	513,383	57,240
1920	37,837	659,840	6,062
1925	44,420	851,351	6,194

See AGRICULTURE, AUSTRALIAN AGRICULTURAL COMPANY, CAMELS, CATTLE, HORSES, PIGS, SHEEP, WOOL.

Paterson, ANDREW BARTON, born near Molong in New South Wales on 17 February 1864, educated at the Sydney Grammar School and trained for the law, at an early age found time to combine with his legal work the writing of cheerful verse inspired by the life of the plain- and hill-stations on which he spent his holidays. In the early nineties his pen-name 'Banjo' became familiar and welcome to readers of the *Bulletin*, and in 1895 his first volume of verse—*The Man From Snowy River*—achieved at a bound the popularity which it has never since lost. He was war correspondent for the *Sydney Morning Herald* in the South African war, saw some of the Boxer war in China, and then became for two years editor of the Sydney *Evening News*, and for another two of its weekly colleague the *Town and Country Journal*. In 1906 he published *An Outback Marriage*, which has great merit as a collection of bush incidents. In the war of 1914-18, as he was over age for active service, he was commissioned lieutenant in the remount service and attached to the Egyptian depot of the Australian Imperial Force, returning to Australia at the end of the war with the rank of major.

Both '*Bulletin* bards,' and both describing to townsmen the genuine life of countryfolk out back, Paterson and Lawson supplemented each other. Lawson's favourite subjects were the swagman, the rouseabout, and the small selector, and his moods were consequently inclined to pessimism or at best to grim endurance. Paterson's bush is the home of the optimist—usually a horseman, squatter, or drover—who takes his troubles in his stride. His literary value is below that of Lawson at his best; but as an interpreter of Australia, whether in cheery verse or in phrases of song that are often shot with true poetry, he is equal to the best of Australian writers, and has a larger sale outside Australia than any other. Up to 1925 90,000 copies of *The Man from Snowy River* had been sold.

Besides the two volumes named above he has published *Rio Grande's Last Race and other verses* (Sydney, 1902), *Saltbush Bill, J.P., and other verses* (Sydney, 1917), *Three Elephant Power and other stories* (Sydney, 1917), and, as editor, *Old Bush Songs* (Sydney, 1905). A collected edition of his verses was published in 1921.

Paterson, WILLIAM (1755-1810), born at Montrose in Scotland on 17 August 1755, at an early age devoted himself to scientific pursuits, more especially the study of botany. In 1777 he visited South Africa and made several expeditions into the Kaffir and Hottentot country east

of the then very limited Dutch settlements; a volume describing these journeys was published in 1789 and dedicated to Sir Joseph Banks. In 1781 he was commissioned ensign in the 98th regiment for service in India (lieutenant, 1783; captain, 1789; major, 1795; lieutenant-colonel, 1798; brevet-colonel, 1808); in 1787 he transferred to the 73rd; two years later he obtained through the influence of Banks a captaincy in the just-raised New South Wales Corps, probably in order to study the botany of a new country in which Banks was interested. He reached Sydney during September 1791, and was sent on to Norfolk Island with its new lieutenant-governor King. Returning at the end of 17 months, he began a series of expeditions into the Blue Mountains, partly to obtain plants for Banks, partly to discover a way across them; in the latter effort he failed, as so many did later, because he entered them by the Grose valley (which he named, though its existence had been known for some years) and was consequently confronted by impracticable rapids along the stream and impassable cliffs (see EXPLORATION BY LAND). When Grose left the colony in 1794 Paterson succeeded to the command of the corps, and from 17 December in that year administered the government until Hunter took it over on 11 September 1795. His administration, while it seemingly satisfied both Hunter and the authorities in London, was weak and characterless, and allowed the military settlers to strengthen their hold on affairs—thus leading up to the perpetual contests with Hunter and King and the final mutiny against Bligh.

In August 1796 Paterson was invalided to England, and during his stay there was promoted lieutenant-colonel and given a fellowship of the Royal Society. Returning to Sydney on 3 November 1799, he resumed command of the corps, and on King's recommendation was in 1801 made lieutenant-governor of the colony. King, it may be noted, describes him as 'a weak, honest man' who 'if he acted from his own ideas of right and wrong would do the right thing'—an estimate confirmed by Paterson's later behaviour. He was, however, spirited enough to challenge Macarthur to a duel, in which he was wounded (see DUELLING).

In June-July 1801 King sent him to explore the Hunter River, the upper part of which was for some time known as the Paterson; and in 1804 he was chosen to plant a settlement at Port Dalrymple in northern Tasmania. There he hoisted the British flag on 11 November, and, exploring the estuary to tide-limit, discovered and eulogized the site of Launceston (q.v.), but inexplicably deferred the establishment of a settlement on it until he had found his first choice, York Town (afterwards called Yorkton), unsuitable. By 1807, however, Launceston (which King wanted to call Patersonia, but was thwarted by the modesty of his subordinate) was occupied, and justifying its choice. Here Paterson—whose jurisdiction extended to lat. 42°S., Collins having the rest of the island in his charge—ruled mildly, more interested in fossils, lerp-insects, and the digestive powers of the Tasmanian wolf than in public affairs, until on 2 March 1808 he heard of the mutiny against Bligh. His first impulse was to proceed to Sydney and take over the government, and he ordered Johnston to send him a vessel; when it arrived, however, it brought information that Foveaux had been made lieutenant-governor (though only during Paterson's stay in Tasmania), and, weary and ill, welcomed the respite and decided to remain outside the turmoil until he should receive definite instructions from London. Foveaux, however, was anxious to shift his responsibility, and on 1 January 1809 Paterson reached Port Jackson, took over the administration on the 9th, and for once acted with firmness: he insisted on Bligh's return to England—and on Johnston's—and confined Bligh to barracks until he agreed to go. (For fuller details of these confused times, see BLIGH, WILLIAM.) This spasm of activity soon ended. Paterson was really ill, and spent most of 1809 recruiting his shattered health in the quiet government house at Parramatta. When Macquarie arrived at the end of the year, Paterson retired into obscurity, embarked with his corps in the *Dromedary* on 12 May 1810, and died aboard her off Cape Horn on 21 June. His conduct in accepting the results of the mutiny instead of restoring Bligh was over-harshly condemned, largely because Foveaux—who in 1808 had assured Paterson that Bligh's conduct had been insufferable—sheltered himself for Macquarie's benefit behind Paterson's alleged approval of the mutineers. But this did not prevent Macquarie from confirming to his widow a grant (made by Foveaux) of 2000 acres of Tasmanian land.

Patey, SIR GEORGE EDWIN, born at Montpellier near Plymouth on 24 February 1859, joined the navy in 1872 (sub-lieutenant, 1878; lieutenant, 1881; commander, 1894; captain, 1900; rear-admiral, 1909; vice-admiral, 1914), served in H.M.S. *Shah* in the Zulu war, and in H.M.S. *Barfleur* during the Cretan insurrection of 1896-7; in 1901-2 he was assistant-director of naval intelligence. In 1910-11 he commanded the second division of the 2nd battle squadron, and in 1912 was selected to command the just-established Australian squadron (see NAVAL DEFENCE). In September 1913 he brought out H.M.A.S. *Australia* (q.v.), took charge of the squadron, and within the next year so trained the young personnel and organized the shore establishments that on the outbreak of war in August 1914 Australian warships took their share of active duty from the first moment without a hitch. The admiralty would not allow Patey to hunt down the German cruiser squadron in the Pacific, whose position he estimated correctly within a fortnight of the commencement of hostilities; instead, he was set to escort expeditions which annexed German island groups, patrol the western Pacific until November, and then take the *Australia* to European waters. In March 1915 he transferred his flag to the *Leviathan* and took command of a squadron (including two Australian light cruisers) which patrolled the coasts of North America and the West Indies; in September 1916 he retired from active service. (M.V.O., 1903; K.C.V.O., 1913; K.C.M.G., 1916.)

Paton, JOHN GIBSON (1824-1907), was born at Kirkmahoe near Dumfries on 24 May 1824 and educated at the parish school, Dumfries Academy, and the Free Church Normal School, Glasgow (D.D., 1891). At 12 he entered his father's business, and in 1847 joined the Glasgow City Mission, to which he was attached for ten years. Responding to a call for missionaries for the New Hebrides, he was ordained at Glasgow, sailed in the *Clutha* in April 1858, accompanied by Joseph Copeland, and landed on Aneityum on 30 August. He settled at Port

Resolution, Tanna, where he endured great hardship and faced many perils. Four years later he visited Australia and collected £3000 towards the cost of a vessel, the *Dayspring*. In 1863 he visited Scotland to obtain missionaries, returning in 1866 and taking up work at Aniwa. The *Dayspring* having been wrecked, Paton visited Australia and New Zealand to collect money to build another. In 1881 he left Aniwa a Christian island and became Foreign Missions agent for the Presbyterian Church of Victoria. In 1884 the Victorian general assembly sent him to Britain to raise money for the purchase of an auxiliary mission ship, to cost £6000. He was successful, returning with £9000, which built the vessel and enabled him to establish new stations. From 1881 to 1901 he toured the world in the interest of the mission, and then made his headquarters at Melbourne. In addition to much translation work, including that of the whole New Testament into the language of Aniwa, he published *The Kanaka Labour Traffic to Queensland* (Melbourne, 1892); *Slavery under the British Flag* (Woodford, 1892); and *The New Hebrides: is France or Britain to Annex them?* (Glasgow, 1885); his *Autobiography* (London, 1889) passed through many editions and contains many interesting particulars of his career. He died at Melbourne on 28 January 1907.

J.C.

Patteson, JOHN COLERIDGE (1827-1871), born in London on 1 April 1827, educated at Eton and Oxford (B.A., 1849), and ordained deacon in 1853, was in 1854 selected by Bishop G. A. Selwyn (q.v.) for missionary work in New Zealand and Melanesia. In February 1861 he was consecrated first bishop of Melanesia, with headquarters in New Zealand, but in 1867 moved his headquarters to Norfolk Island, where the climate was more congenial for native trainees under instruction for missionary work. He protested unavailingly against the evil doings of Queensland and Fijian labour-recruiters in the islands, and in the end fell a victim to their malpractices; on 20 September 1871 the natives of Nukapu (in the Santa Cruz group), desperately angered against all white men, avenged the recent kidnapping of five of their young men by clubbing him to death. His body was set adrift in a canoe, and recovered by the missionary party.

See Charlotte Yonge's *Life of Bishop Patteson.*

Pea Bush. See NARDOO.

Peaches. See FRUIT-GROWING.

Peacock, SIR ALEXANDER JAMES, born at Creswick in Victoria on 11 June 1861, entered the public service as a teacher in 1874, but after five years turned to politics by way of the Australian Natives' Association, of which he was a director in 1883 and president in 1885-6. In March 1889 he entered the Victorian assembly as member for Allandale, which seat he has held ever since. In November 1890 he joined the Munro ministry without holding a portfolio, and thus commenced a ministerial career which lasted (with short breaks in 1893-4 and 1899-1900) almost continuously until June 1902; from February 1901 to June 1902 he was premier, and again from 1914-17, and in 1924; he held minor offices in 1907-8, 1918-24, and 1925. He has in several ministries done good work as minister for public instruction. (K.C.M.G., 1902.)

Peanuts. The peanut, earthnut, or groundnut, *Arachis hypogaea*, supposed to be a native of the western coast of South America has become naturalized in many parts of the world—India, China, Japan, the United States of America, and other countries—where it is cultivated extensively for commercial purposes. It was introduced into New South Wales before the middle of last century, but no efforts were made to cultivate it commercially until after the war of 1914, although it had been found to thrive admirably in many parts of the Commonwealth. About 1895 trials were made at the government experimental farm, Wollongbar, Richmond River, New South Wales, which demonstrated conclusively that satisfactory yields could be produced in Australia; but although considerable quantities were imported, no attempt was then made to grow them for the market. In Queensland an area of 102 acres was under crop in 1915; this yielded 85,864 lb. and since then the area has been increased. There is now an import duty of 6d. per lb. on shelled and 4d. on unshelled peanuts. There are so many uses for this nut—the production of oil, peanut butter, peanut flour, and in confectionery—that it is likely to be grown in large quantities in Australia.

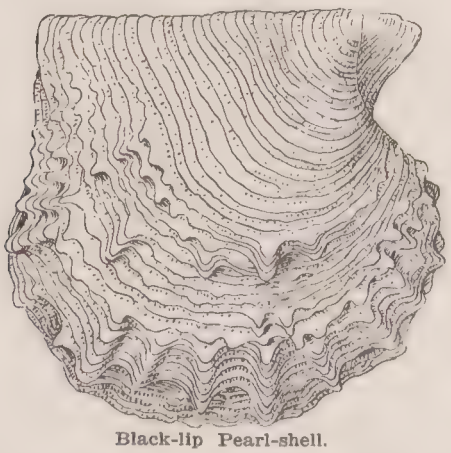
W.S.C.

Pearce, GEORGE FOSTER, born at Mount Barker in South Australia on 14 January 1870, moved to Western Australia in 1892 and was for a time resident on the goldfields. He identified himself closely with the labour movement, and was secretary to the united trades council in Western Australia in 1896 and president in 1899. In 1901 he was elected one of the six representatives of Western Australia in the first federal senate, and has retained his seat ever since. In 1906 he was appointed chairman of committees; he was minister of defence in the first Fisher ministry (1908-9), and the second (1910-13), and held the position continuously in the third of Fisher's ministries and all four of Hughes, until December 1921, thus becoming responsible for the military side of the Australian effort throughout the war of 1914-18, and up to July 1915 for the naval side also. In 1921 he was transferred to the home and territories department, which he held till June 1926 when he was appointed vice-president of the executive council. His political career has well exemplified the sober progressiveness of the pre-war Labour party. His administrative career has mainly consisted in a careful choice of the best available permanent advisers and in giving them an intelligent support; to this steadily pursued policy was due the success of two great experiments in defence conducted mainly under his supervision—the introduction of compulsory military training and the organization and despatch of the Australian Imperial Force in 1914-15.

Pearl Perch. See JEWFISH.

Pearls and Pearling. Several species of oyster have a shell with a nacreous lining, and may exceptionally produce a pearl, but only three species of pearl-oyster are recognized in commerce—the golden-lip, the black-lip, and the Shark Bay shell. By far the most lustrous and valuable is the Golden or Silver-lip (*Pinctada maxima*), which in Australian waters occurs on the tropical coasts between Exmouth Bay on the west and Townsville on the east. This is much the largest of the family, the weight of a pair amounting to over eight pounds. The handsome and valuable pearls that this oyster often

contains are regarded as a by-product; the trade depends on the oyster-shell itself, the mother-of-pearl, which is exported for manufacture into knife-handles and articles of jewellery. The Black-lip (*Pinctada margaritifera*) ranges be-



Black-lip Pearl-shell.

yond Australia to Ceylon and the South Sea islands. Both in size and in the quality of its nacre and pearls it is inferior to *P. maxima*. The Shark Bay shell (*Pinctada carchariarum*) is a small kind, peculiar to the Shark Bay district, and (like the Ceylon shell) is gathered

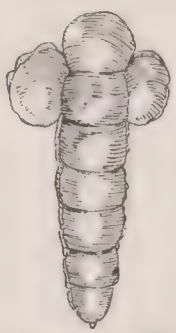
Pinctada carchariarum.

for the pearls, not for the shell. The oysters are separated from the shell and thrown into a tub to rôt; when the mass is softened by decomposition, the contained pearls are strained out uninjured.

The pioneer of Australian pearling was one Tays, an American sailor who settled at Nickol Bay in Western Australia. Recognizing the value of the pearl-shell strewn about in abundance, he began in 1861 to gather it for export. When the beach itself had been stripped of shell, aboriginals were engaged to dive off-shore; when they had reached the limits of their endurance (about 50 feet), diving-dresses were procured for them, so that the shell might be followed into still deeper water. The industry expanded so fast that in 1871 the western fishery employed a fleet of a dozen vessels of from 15 to 90 tons burthen, which collected in the aggregate 180 tons of mother-of-pearl.

The Torres Straits fisheries began in 1868, when William Banner, master of the brig *Julia Percy*, commenced operations at the Warrior Reefs. The industry grew rapidly, and in 1871 ten vessels secured nearly 200 tons of shell. By 1883 the Queensland pearling-fleet consisted of 206 vessels. As the fisheries grew in importance the government was obliged to regulate them by various restrictions and enactments. Both men and boats were licensed, the gear submitted for inspection, and limits placed on the size of the shell and on the depths from which it might be taken. In fair weather and with modern diving-dress a diver may spend two hours at a time in water from eight to ten fathoms deep. In greater depths his stay must be shorter, and in 30 fathoms he risks his life by a visit of more than a few seconds. The oysters are so scattered on the floor of the sea that a good deal of walking is necessary to find them; they lie about, either loose or fastened by strings to a rock. Usually the valves gape apart, and the diver must take care that his fingers are not nipped when they close.

Among famous Australian pearls the 'Southern Cross' is notable. It was found off Baldwin in Western Australia in 1883. It is formed of nine separate pearls, grouped in the form of a cross 1½ inches long; seven form the shaft, two—not well balanced—the arms; the individual pearls are not of great size or beauty, and the gem's value depends on its unusualness. The finest pearl yet found in Australian waters is a drop-shaped gem the size of a sparrow's egg, weighing 100 grams, which was found on the Western Australian coast in 1917. It was named 'The Star of the West' and valued at £14,000.



'Southern Cross' compound pearl.

The average annual product of the pearling industry in 1920-24 was:—pearls, value £48,678; pearl-shell, 2197 tons valued at £301,407. About two-fifths of the product came from Queensland and the rest from Western Australia. There is an infant pearling industry in the Northern Territory, but the production is at present insignificant; in 1924 only fourteen tons were obtained there, and pearls valued at £200 were found.

C.H.

Pears. See APPLES AND PEARS, FRUIT-GROWING and PLANT-BREEDING.

Pearson, CHARLES HENRY (1830-1894), born at Islington near London on 7 September 1830 and educated at Rugby, King's College, London, and Oriel and Exeter colleges, Oxford (B.A., 1852; M.A., 1854), after a distinguished career as fellow of Oriel (1854-73), professor of modern history at King's College (1855-65), and lecturer on modern history at Trinity College, Cambridge (1869-71), in 1871 migrated to South Australia, which he had already visited in search of health in 1865-6. In 1874 he lectured on history at the university of Melbourne, and in 1875 became the first headmaster of the Melbourne Presbyterian Ladies' College. In 1877 he was made a royal commissioner to investigate edu-

cation in the colony, in 1878 entered Victorian politics as member for Castlemaine, and accompanied Graham Berry (q.v.) on his 'embassy' to England. In Berry's third ministry (1880-1) he was minister without portfolio, and administered the education department in the Gillies-Deakin coalition of 1886-90. From 1883 to 1892 he was member for the East Bourke boroughs. His chief work as minister for education was the separation of secondary from primary education, mainly by (*a*) lowering the limit of compulsion from 15 years of age to 13, thus releasing at the lower age all children not intended to pursue a secondary course, (*b*) founding 200 scholarships annually for primary students intending to enter high schools, and (*c*) establishing 14 technical schools; among his other reforms was the improvement of art teaching in the state schools. As official champion of an educational system which from 1873 onwards had been avowedly 'free, compulsory and secular,' he incurred bitter opposition from the advocates of a denominational system. Leaving office with his colleagues in 1890, he became Australian correspondent of the London *Speaker*, and with his always detached and often caustic criticisms of Australian affairs awoke further ill-feeling against himself. At the elections of 1892 he refused to stand, and in August of that year left Melbourne for England. There he was made permanent secretary to the Victorian agent-general's office; but in 1894 he was informed that the Victorian ministry had decided to retire him—on the ground that their secretary ought to be a sort of export agent and purveyor of Victorian products, not a man of books and ideas. On 29 May he died.

Pearson was a man of the type which is so easily described—and dismissed—as 'unsuited to colonial life.' Cultured and aloof from the petty partisanships of local politics, he certainly found the conditions of colonial life trying. But without him, and a few like him, Australian literary and political life would have been immeasurably poorer; nor would he, probably, have been so valuable in England among a number of learned historians as he was in Melbourne, lonely on a peak but calling others up to him. His principal historical work, done in England, included a *History of England During the Early and Middle Ages* (London, 1867) and *Historical Maps of England During the First Thirteen Centuries* (London, 1867); the literary fruit of his Australian career was *National Life and Character* (London, 1893), a pessimistic prophecy which has come unexpectedly true in certain details, while its central contention—that the world's future lies with the yellow and black races—is still mere hypothesis.

Stebbing's *Charles Henry Pearson* (London, 1900) includes autobiographical matter for the English period of his life.

Pedder, Sir John Lewis (1784-1859), born in England in 1784 and educated at the university of Cambridge (LL.B., 1822), had already studied for the bar and had been admitted at the Middle Temple in 1820. On 18 August 1823 he was appointed chief justice of Tasmania, and reached Hobart on 22 March 1824, bringing with him the new charter of justice for the colony. On 10 May he opened the first sessions of the supreme court. He soon struck out for himself, refusing to follow the chief justice of New South Wales (Francis Forbes) in granting trials by civilian juries, which he considered unconstitutional. In 1825, when Tasmania ceased to be an appanage of New South Wales, Pedder was appointed to both the executive and the legislative council of the colony—positions not easy to reconcile with his tenure of the chief justiceship. Arthur got on well with him, although he had to complain of his meticulousness—'life is much too short to wait for his opinions and decisions'—as a councillor. With Franklin nearly anyone could get on. But Denison was of a different temperament, and in 1848 Pedder and he came into violent collision. The legislative council had passed an act under which dogs were taxed, and Pedder and his colleagues on the bench ruled that it was unconstitutional, because the council had no power to impose taxes for other than local purposes—a decision which also invalidated the acts imposing customs duties. Denison contended that the chief justice had neglected his duty, not having certified to the illegality of the measures within a fortnight of their enactment (as was the regular procedure), and tried to suspend Pedder, but the members of the executive council shrank from this action. Asked to take leave of absence till the matter had been referred to the authorities in England, Pedder refused thus to help the governor out of his difficulty. In the end the colonial office upheld Pedder, and gave Denison what Lady Denison described as 'an awful rap over the knuckles.' On 1 August 1854 Pedder retired, after 31 years' service, returned to England, and died there in 1859. (Kt. Bach., 1838.) T.D.

Pediculidae. See Sucking-lice.

Peel, Thomas, a near relative of Sir Robert Peel the statesman, was one of a body of capitalists who in 1828 formed an association for establishing a settlement at Swan River in Western Australia. They proposed, in return for a grant of four million acres of land, to send out 10,000 settlers with sufficient stock to keep them going; but the British parliament did not care to countenance colonization on so large a scale, and cut down the terms until all the promoters except Peel dropped out. He was in the end granted (*a*) a special reserve of 250,000 acres if he landed at least 400 settlers before 1 November 1829, (*b*) a further 750,000 acres in proportion to any further capital he might invest. As he did not land at Swan River until early in December 1829, and brought with him only 300 settlers, his special grant of land lapsed, but an area of 250,000 acres (known as Cockburn Sound Location 16) was provisionally assigned to him. Inefficiency and ignorance of local conditions rapidly brought about the failure of his scheme. His settlers obtained land independently, his stock wandered away, and a considerable quantity of the goods and chattels that he had brought with him rotted on Fremantle beach. As a recompense, however, for his attempt, his title to the Cockburn Sound location was confirmed in 1834. He settled down at Mandurah and died there, a disappointed, bitter, and comparatively poor man, in 1864. J.S.B.

Peel River Land Company. See Australian Agricultural Company.

Peerage, Australian. In 1853 W. C. Wentworth's select committee, appointed by the legislative council of New South Wales to draft a constitution bill (see Constitutions), recommended the creation of peers with hereditary titles to form a body from which members of the upper house under responsible government should be drawn. In 1852 a similar committee

had found great difficulty in devising a constitution for the upper house, and, though a tentative suggestion for a nominee chamber had been made, it was agreed that the subject required further deliberation. The committee of 1853 finally drafted two clauses, the object of which was explained at length in a report presented to the legislative council on 28 July 1853:

. . . Your Committee . . . desire to have a form of Government based on the analogies of the British Constitution. They have no wish to sow the seeds of a future democracy; and until they are satisfied that the nominated, or the future elective Council, which they recommend, will not effect the object they have in view, of placing a safe revising, deliberative, and conservative element between the Lower House and Her Majesty's Representative in this Colony they do not feel inclined to hazard the experiment of an Upper House, based on a General Elective Franchise. They are the less disposed to make the experiment as such a Franchise, if once created, will be difficult to be recalled.

Actuated by these views, your Committee have introduced into the Bill 'to confer a Constitution on the Colony, and to grant a Civil List to Her Majesty,' two clauses, which, to a certain extent, are framed in accordance with analogous clauses to be found in the Imperial Act, 31 Geo. III, c. 31, 'for making more effectual provision for the Government of the Province of Quebec.' That Act authorizes the Crown, whenever it thinks proper to confer any hereditary title of honor, rank, or dignity, to annex thereto an hereditary right of being summoned to the Legislative Council. Your Committee are not prepared to recommend the introduction into this Colony of a right by descent to a seat in the Upper House; but are of opinion that the creation of hereditary titles, leaving it to the option of the Crown to annex to the title of the first Patentee a seat for life in such House, and conferring on the original Patentees and their descendants inheritors of their titles a power to elect a certain number of their order to form in conjunction with the original Patentees then living, the Upper House of Parliament, would be a great improvement upon any form of Legislative Council hitherto tried or recommended in any British colony. They conceive that an Upper House framed on this principle, whilst it would be free from the objections which have been urged against the House of Lords, on the ground of the hereditary right of Legislation which they exercise, would lay the foundation of an aristocracy, which, from their fortune, birth, leisure, and the superior education these advantages would superinduce, would soon supply elements for the formation of an Upper House, modelled, as far as circumstances will admit, upon the analogies of the British Constitution. Such a House would be a close imitation of the elective portion of the House of Lords, which is supplied from the Irish and Scotch peerage; nor is it the least of the advantages which would arise from the creation of a titled order, that it would necessarily form one of the strongest inducements not only to respectable families to remain in this Colony, but to the upper classes of the United Kingdom and other countries who are desirous to emigrate, to choose it for their future abode.

On 29 July the *Empire* (Henry Parkes's newspaper) called on all citizens to oppose the two clauses in the draft bill providing for a colonial aristocracy with legislative functions 'which while it kept us slaves, would make us the laughing stock of every civilised nation.' A committee was formed to organize opposition, and on 15 August the disputed clauses were condemned at a meeting attended by many members of the existing legislative council, and resolutions passed in favour of a representative legislature consisting of two chambers elected by popular franchise. On the following day Wentworth moved the second reading of the constitution bill, which was carried on 2 September; but the opposition to his peerage proposals could not be ignored, and by 7 December (when the bill entered its committee stage) he had reluctantly agreed to abandon them, accepting in their stead the nominee principle for the upper house.

In 1918 Sir John Forrest was created a peer of the United Kingdom for services rendered to the Empire in Australia; in a sense, therefore, he may be called the only Australian peer. He died without issue.

Peewee. See MAGPIE-LARK.

Pelican, a very large aquatic bird (*Pelecanus conspicillatus*), the only member of the family Pelecanidae found in Australia. Its plumage is mainly white, the flight-feathers of the wings and the tail being black. Beneath the long beak is a large flesh-coloured pouch which is capable of being enormously distended to hold a large catch if the bird is successful in fishing. The Australian pelican has the distinction of being the largest member of the family, which has an almost world-wide distribution. It also differs from all other pelicans in that the patch of naked skin round the eye is separated from the bill by a feathered tract. It occurs in suitable localities throughout Australia, Tasmania, and New Guinea, chiefly inhabiting lakes and rivers, but sometimes appearing also on the sea-coast. It breeds on small islands off the

Pelican (*length* 36 *in.*).

coast, and in swamps in the interior. In southern Australia its numbers have been greatly reduced by fishermen and others, who regard it as an enemy, but the remnant now receive protection in most of their breeding localities. Pelicans, when once fairly started from the water, are strong fliers, and delight in circling at a great height in the air. They are sociable in habits, and often form large flocks.

The Australian pelican, like the black swan, was first seen by the Dutch explorer Vlamingh in 1697, on the Swan River in Western Australia. He mentions them in his narrative under the expressive old Dutch name of 'Kropganzen' (crop-geese). Two years later Dampier met with them in Shark Bay. W.B.A.

Pelsart, FRANCIS, a Dutch master mariner known only as the commander of the merchant-vessel *Batavia*, which in 1628-9 made a disastrous voyage from Holland towards the Dutch Indies. She left the Texel on 28 October 1628 in company with two other vessels, part of an expedition of 11 in all. Encountering severe weather, she found herself on 4 June 1629 alone off a little-known and very dangerous coast—the Houtman Abrolhos that lie off Geraldton in Western Australia—and just before sunrise

struck on a reef at their southern end, going to pieces some days later. Most of the provisions were salvaged, and the greater part of the crew and passengers reached two small islands in safety, but without any considerable supply of water. Pelsart, after a vain search through the neighbouring islets, decked the only boat left to him and made for the mainland. After coasting along for about 100 miles without finding any river or reliable water-supply, he determined to head for Batavia, and reached that port on 5 July; the governor lent him the frigate *Sardam*, and he returned to rescue the castaways. But during his absence a certain Jerome Cornelis, the supercargo of the *Batavia*, had made himself leader of a section of the crew, planned to seize eight chests of silver money that were part of the wrecked vessel's cargo, and murdered or outraged all who would not follow him to a career of piracy except a small party under a soldier named Weybehays. Pelsart on his return was forewarned by Weybehays (who had by good luck captured Cornelis), and with a little care managed to place the rest of the mutineers in irons; a few days later he called a council of war and on its advice hanged the lot, except two whom he put ashore on the mainland and who were never heard of again. He recovered five of the eight treasure-chests, and on 28 October sailed for Batavia. See AUSTRALIA, DISCOVERY OF. W.J.

Penguins, marine flightless birds of the family Spheniscidae, peculiar to the southern hemisphere, and most numerous in the Antarctic and sub-Antarctic regions. Several southern forms occasionally straggle as far as north as the coasts of Tasmania and southern Australia; but

Little Penguin (*length* 18 *in.*).

only one species, the Little or Fairy Penguin (*Eudyptula minor*), is resident in Australian seas, breeding in great numbers on some of the islands off the southern coast, and ranging north as far as Moreton Bay on the east coast and the Swan River on the west. W.B.A.

Pennant-fishes (*Alectis*), also known as 'diamond trevally' and 'silvery moon-fish' on account of their curious form and coloration, have greatly compressed and deep, angular bodies, with long filaments trailing backward from their dorsal and anal fins. Their form changes considerably with age, but they are brilliantly silver at all stages of growth. The genus includes two tropical species, ranging throughout the Indian and Pacific oceans—one even extends to the Atlantic. They are allied to the trevally (q.v.), and occasionally attain a length of nearly five feet. A.R.McC.

Pensions, OLD-AGE, INVALID, AND WIDOWS'. An old-age pensions scheme brought before the New Zealand parliament in 1896 proposed to allow 10s. a week to any aged person whose income—other than from personal exertion—was less than £52 a year. This bill did not pass. It was introduced in an altered form in 1897 (after a general election) and was rejected again; in 1898 it became law. The act granted a pension during good conduct to needy persons 65 years old and over. Although New South Wales was already spending £580,000 in charitable enterprises, in 1900 its parliament decided to introduce a system of old-age pensions; this was chiefly due to the exertions in 1897-9 of John Cash Neild, then representing Paddington in the legislative assembly, whose experience of the actuarial side of life-assurance business made him a valuable advocate. Victoria, however, was first in the field, for early in 1899 Sir George Turner, then premier, sent Robert Best and W. A. Trenwith to New Zealand to take note of newly-passed experimental laws there. They reported specially on the old-age pension system, and Sir George introduced a bill which was a copy of the New Zealand act, with certain additions intended to make for economy; but the Turner ministry fell in 1899, and nothing was done till it returned to office in 1900, when the bill was passed. It came into force on 1 January 1901.

In New South Wales Sir William Lyne on 13 September 1900 carried in the legislative assembly a resolution empowering him to bring in an old-age pensions bill; two months later the measure passed through parliament, but did not come into operation till 1 July 1901. Sir William frankly admitted that it was copied from the New Zealand law 'with certain important modifications.' The maximum pension was £26 a year, £1 being struck off for every £1 of other income in excess of £27. Any person earning £1 per week was debarred altogether. Married couples living together were entitled to only three-fourths of the two pensions; those living apart were allowed the full amount for each. A novelty in the Lyne act was that the officials administering the law were empowered to consider applications from needy persons 60 years old and upwards who were disabled by sickness or accident. Application for a pension-certificate was to be made to a board of three officials whose enquiries were to be private. Every £15 worth of property owned by a pensioner diminished the pension by £1, so that a person owning £390 was disqualified altogether. To qualify for a pension the applicant had to be a British subject who had lived in the colony for at least 25 years continuously —'continuously' meaning that his or her cumulative absences had not exceeded two years in the 25. In the case of Australians, residence in another State counted as residence in New South Wales, provided that the other State made reciprocal arrangements. Naturalized aliens must have been naturalized ten years before they could apply, and aborigines were classed with Asiatics and excluded altogether. The act forbade pensioners to live in charitable institutions; in this it differed from the law of New Zealand, where local poor-law boards were expressly forbidden to refuse to admit them.

The Victorian act, being intended to serve as a stop-gap while parliament and the ministry devised another, ran for six months only. Makeshift as it was, it affirmed the principle of old-age pensions, but there its merits began and ended. It provided that on and after 18 January 1901 every Victorian who had lived 20 years in the colony and was at least 65 years of age and poor, might apply to a justice of the peace

PARROTS

Plate XXXVI

Drawn by Neville W. Cayley.

Alexandra Parrot
(*Polytelis alexandrae*).

Red-winged Parrot
(*Aprosmictus erythropterus*).
(Male).

Red-winged Parrot
(Female).

or police-magistrate for a pension of 1s. a day for four weeks in advance; during that period enquiry was made into the applicant's character and circumstances, and if the case was genuine the grant was confirmed. Persons under 65 might also claim pensions on the ground that their health had been ruined by working in mines or at some unhealthy trade. Alexander Peacock, Turner's successor in the premiership, pointed out the grave defects of this act, and substituted one which came into force on 7 December 1901 and cost the Victorian government £283,000 in pensions in the year ending June 1902. This act is notable for the number of its precautions and reservations, and for the care with which it tried to confine pensions to the enfeebled and utterly necessitous. It retained the clause in favour of those whose health had been injured by an unhealthy occupation—but no pension was to be paid under this section until the State treasurer had approved of it in writing. All claims were to be heard in open court (in this Victoria followed New Zealand, not New South Wales), but the examination was to be before commissioners, not magistrates. Notice of the hearing was to be sent to the police and to all charitable institutions in the neighbourhood, and the 'fullest evidence may be taken—whether strictly legal or not—as to the claim of the claimant.' The pension granted was a sum sufficient to bring a pensioner's income from all sources up to 8s. a week; an exemption of 2s. a week was allowed on earnings from personal exertion. If a claimant appeared capable of earning or partly earning his living, the pensions commissioner could either refuse the claim, or could grant less than 8s. a week. To be entitled to the two shillings exemption, the petitioner must have no more than £25 in goods of any kind. Applicants had to prove that they had made reasonable efforts to maintain themselves and, if they had a family, must show 'that the husband, wife, father, mother, or children of the claimant, or any or all of them, are unable to provide for or maintain the claimant.' Members of the claimant's family must show cause why they should not contribute to the claimant's support. Finally, no one could receive a pension-certificate unless he had executed a deed-poll undertaking—on demand—to transfer to the government all his real property; the treasurer might then sell the property, and deduct from the proceeds all sums paid to the owner by way of pension. These harsh restrictions resulted from the hopeless failure of Turner's temporary measure; some were necessary, and influenced both the New Zealand and New South Wales systems. The only other State in the Commonwealth to pass a pensions act was Queensland, whose act became law in July 1908.

The State acts were superseded by the Commonwealth invalid and old-age pensions act of 1908, which provided for the payment of old-age pensions throughout Australia from 1 July 1909, and of invalid pensions from 1 December 1910. The general administration of the act is in the hands of a commissioner, with a deputy commissioner in each State, who are empowered to summon witnesses, receive evidence, and require the production of relevant documents. The States are divided into districts, each in charge of a registrar who receives and investigates claims and keeps the necessary records. The age qualification is that laid down in the State acts, except that the age-limit in the event of permanent incapacitation for work is 60 years whereas for an invalid pension it is 16 years. The residential qualification for the old-age pension, first fixed at 25 years, has been altered to 20 years' continuous residence; for the invalid pension at least five years are required. The word 'continuous' has the same meaning as in the State acts. The applicant must be residing in Australia on the date of application, and must have become incapacitated while in Australia. The rate of payment is fixed by the commissioner or deputy commissioner; originally it was not to exceed £26 a year, and must not make the pensioner's total income exceed £52 a year; where an applicant was in receipt of board and lodging, this counted as an income of 5s. a week. In 1916 these amounts were altered to £32, £58 10s., and 7s. 6d. respectively; in 1919 the rate of pension was raised to £39 a year, the maximum amount of property to £65, and the estimated value of board and lodging to 10s. In 1920 special provision under the invalid pensions act was made 'for a permanently blind person, by which the amount of his pension may be at such a rate (not exceeding £39) a year, as will make his income, together with the pension, equal to an amount not exceeding £221 a year or such other amount as is declared to be a basic wage.'

Payments received by way of benefit from any registered friendly society, or during illness, infirmity, or old age, from any trade-union, provident or other society, are not treated as income. The pension may be reduced by £1 a year for every complete £10 by which the net capital value of the pensioner's property is in excess of £50. If both husband and wife are pensioners, the deduction in the case of each is £1 for every £10 by which the net capital value exceeds £25; if legally separated, the deduction for a single person applies. From the value of accumulated property is deducted the capital value of the pensioner's home, and all encumbrances on the property. Accumulated property (whether in or out of the Commonwealth) to the value of £310 disqualifies for a pension, as does the applicant's direct or indirect deprivation of himself of such property with the object of obtaining a pension. In the case of husband and wife, except when living apart, the net capital value of the accumulated property of each is deemed to be half the total net capital value of the accumulated property of both, and the amount of property allowed, prior to deduction, is £50 if including, and £25 if not including, a home. Good character is an essential for qualifying as a pensioner. For war-pensions see REPATRIATION.

The following table shows the working of the act since 1 July 1909:—

Year ending 30 June	Number of Pensioners.		Total payment.	Cost of administration.
	Old Age.	Invalid.		
			£	£
1910	65,492	.....	1,497,485	37,146
1911	75,502	7,451	1,871,240	39,244
1912	79,071	10,763	2,155,481	41,794
1913	82,943	13,739	2,302,335	44,523
1914	87,780	16,865	2,592,201	47,015
1915	90,892	20,417	2,731,939	48,018
1916	91,783	23,439	2,891,597	44,401
1917	93,672	26,781	3,554,135	54,393
1918	95,387	29,912	3,793,037	54,355
1919	95,969	31,999	3,936,615	63,280
1920	99,170	35,231	4,484,304	74,120
1921	102,415	37,981	5,150,241	88,271
1922	105,096	39,019	5,380,034	93,608
1923	107,389	40,064	5,423,016	87,910
1924	113,054	42,617	6,426,752	92,366
1925	117,516	44,840	6,896,401	94,486

J.V.C.-B.

Widows' Pensions.—The Widows' Pensions Act of New South Wales was passed by the Lang (Labour) government in 1925, and came into operation on 24 February 1926. At that date it was the only act of its kind in the Commonwealth. A pension is payable under the act to a widow domiciled in New South Wales at the date of her husband's death, residing in the State at the date of her application for the pensions certificate, having so resided continuously for three years previously, and having at the date of her application a child or children under the age of 14 years wholly or mainly dependent upon her for support. Continuous residence is not deemed to have been interrupted if the claimant's absences did not exceed in the aggregate a tenth of the total period of residence, or if she proves that during the period of her absences her family or home was in New South Wales. It is further stipulated that she must be of 'good moral character and sober habits,' and that the pension must be properly used. The act applies to women who became widows before the commencement of the act as well as to those who became widows subsequently, but the pension is not payable to aliens, to Asiatics not born in Australia, or to aboriginal natives of Africa, the islands of the Pacific, or New Zealand. It is at the rate of £1 a week for the widow and 10s. in respect of each child under the age of 14 years wholly or mainly dependent upon her. If the widow's net income exceeds £78 a year, the pension is reducible by £1 a year for each £1 by which the £78 is exceeded, but rent up to £78 a year paid by the widow is not deducted in the calculation of income. No deduction from the pension is made on account of the widow's ownership of a house, provided she lives therein; of furniture or personal effects; or of any amount exceeding 25 per cent of the earnings of a child or children over 14 years of age residing with her. Stepchildren, children legally adopted before the commencement of widowhood, or illegitimate children of the claimant not born during her widowhood are included in the benefits of the act. Claims are lodged with the clerk of petty sessions nearest to the place of abode, who makes the necessary enquiries and submits each claim to a police or stipendiary magistrate. He in turn makes his recommendation, to the registrar of widows' pensions. One of the chief objects of the act is to enable widowed mothers to remain at home and look after their children, instead of having to go out to work at the risk of neglecting them. The pension is granted for a period of one year, at the close of which application must be renewed. It must be forfeited when the pensioner becomes qualified to receive an old-age or invalid pension under a federal act. By 30 June 1926 the number of pensions granted was 4433, and the sum paid in respect of these £126,466; it was estimated that the total cost of the pensions would be £500,000 a year. On 31 March 1925 there were 65,500 widows in the State, with 35,600 dependent children; the estimated number of widows in 1926 was 66,500. The census of 4 April 1921 classified the widows of the State into the following age-groups:—under 30, 1788; 30-45, 9149; 45-60, 18,037; 60 and over, 31,727. The New Zealand widows' pensions scheme is on a lower scale, £52 a year being allowed to a widow with one child under 15, and £26 a year for each additional child under 15, the maximum allowance payable being £208 a year. L.G.W.

Pepper Tree. See MAGNOLIACEAE.

Perch. The English perch (*Perca fluviatilis*) has been introduced into many parts of Australia, but has not established itself in any numbers. Australian waters have yielded no indigenous species of the family Percidae, of which the English perch is typical; but the name has been locally applied to many widely different species, for which see BANDED SEA PERCH, BLACKFISH, EMPEROR BREAM, FRESHWATER PERCH, GIANT PERCH, GOLDEN PERCH, JEWFISH, MACQUARIE PERCH, ORANGE PERCH, RED PERCH, RED ROCK COD, and SILVER PERCH. A.R.McC.

Peripatus a primitive genus of arthropods so distinct from other arthropods that the class Prototracheata (or Onychophora) has been created for it alone. While indubitably an arthropod, since it breathes through special tubes (tracheae) like the majority of insects, its structure is in several other respects assimilated to that of the Chaetopoda or segmented worms; it is thus one of the rare links between distinct phyla of animals that help us to understand the meaning of evolution in the Darwinian sense. [*Ceratodus*, q.v., is another.]

Peripatus, though rare, is widely distributed; species are found in South Africa, the West Indies, South America, New Zealand, Sumatra, Borneo, and the Malay Peninsula, as well as in various parts of Australia. Bouvier, indeed, on anatomical grounds divides the Onychophora into several genera, confining the name *Peripatus* to the South American species, and classing the Australian and New Zealand species (except the oviparous forms to be mentioned below) under a new genus *Peripatoides*. For many years it was supposed that all the species were viviparous. Most of them certainly are; but in 1889 Arthur Dendy discovered that two Victorian species (one of which extends to Tasmania) and two or three species found in New Zealand are oviparous, the eggs possessing strongly-marked insect characters. This was important evidence of the relationship of *Peripatus* to the Insecta. For the oviparous form Dendy founded the genus *Ooperipatus*, of which the species *O. oviparus* occurs in Victoria, New South Wales, and Queensland, *O. insignis* in Victoria and Tasmania, and *O. paradoxus*, a very fine species, in Queensland. The females of *Ooperipatus* are characterized by the possession of a large fleshy ovipositor, which is lacking in the viviparous *Peripatoides orientalis*, the species most common in New South Wales, and in *P. gilesi* from Western Australia. The males of the two genera are, in the dark-coloured forms, quite indistinguishable from one another. But in New South Wales *P. orientalis* varies in colour from deep uniform black to light tawny-brown.

Ooperipatus insignis (x 6).

The food of *Peripatus* consists of insects, wood-lice, and the like, termites being a favourite article of diet. All the soft parts are eaten, including the legs of small insects. The antennae appear to be endowed with a sense analogous

to that of smell. The skin is cast at somewhat irregular intervals. In the case of young born in captivity, the first ecdysis occurs when the creatures are between one and two weeks old. The skin splits down the median dorsal line and its removal is aided by the animal's jaws. After being shed the skin is usually swallowed.

Peripatus is provided with an elaborate slime-secreting and discharging apparatus, consisting of a pair of large glands connected with papillae, one at each side of the mouth. The slime is used as a means of defence, or for securing prey, and is emitted from both papillae simultaneously with sufficient force to project it several inches. It is extremely viscid, and so embarrasses an enemy or hampers a struggling insect. The breeding-season of *P. orientalis* lasts from about the middle of November to the middle of March, individual females giving birth to their litter during about a month. They are about 5 millimetres in length when born, and over a period of 12 months grow at the average rate of rather less than 1 millimetre per month. *Peripatus* is a very sociable creature; its individuals do not molest one another, and love to crowd together in congenial lurking-places. Several may frequently be seen feeding in perfect harmony on one insect.

See Bouvier in *Annales des Sciences Naturalistes* (1907); Dendy in the *Quarterly Journal of Microscopic Science* (1902) and in *Zoologische Anzeigungen* (1906); and Dendy, Fletcher, and Steel in *Proceedings* of the Linnean Society of New South Wales, 1894-6. T.S.

Perlaria, an order of aquatic insects known as stone-flies, a very ancient group with no very near relatives in existence, though on the one side they show affinities with the Orthoptera and on the other with the oldest holometabolous orders (see INSECTS). They may be recognized by their habit of folding the wings closely down along and above the abdomen; the long slender antennae project forward, and the long cerci backward in the same line. The larvae are aquatic, and superficially not unlike those of may-flies, from which they may be distinguished by their possessing only two caudal filaments instead of three, and by the lack of the leaf-like, paired gills along the sides of the abdomen.

This order is abundant in colder regions, including Tasmania and New Zealand, where the beautiful Eustheniidae have their headquarters. A number of species of the type-genus *Eusthenia*, found in Tasmania, are certainly the most remarkable of all Perlaria. The best-known is *E. spectabilis*. Two beautiful (but rarer) species of this genus are shown on plate xix, *Eusthenia lacustris* (fig. 15) and *E. violacea* (fig. 16). The larvae of this genus are fierce, active, dark-green creatures, living upon the under-side of rocks in swift streams. They are furnished with gills in the form of a series of paired filaments upon the abdomen, resembling those of Megaloptera.

The only other family represented at all commonly in Australia is the Leptoperlidae, small inconspicuous insects very rarely seen by collectors. They emerge in the winter and early spring, and may be found sitting upon the stalks of reeds or grass, from which they are very seldom seen to fly. Several species have been described from Tasmania, but only two from the mainland. They are, however, abundant enough in their season, and the author has nearly 30 unnamed species in his collection. *Dinotoperla carpenteri* is a small blackish species found resting on grass-stems near water in the Sydney district; it is shown at rest in the text-figure. Their larvae are tiny inert creatures that cling

Dinotoperla carpenteri (at rest).

close to rocks under water, simulating growths of weed or moss. They are furnished with a beautiful tuft of pink gills round the anus.

See Sharp in *Cambridge Natural History*, and Froggatt's *Australian Insects*. R.J.T.

Perry, CHARLES (1807-1891), born on 17 February 1807 at Hackney near London and educated at Harrow and Trinity College, Cambridge (B.A., 1828; M.A., 1831; D.D., 1837) after studying for the bar entered the Anglican ministry (deacon, 1833; priest, 1836) and lived at Cambridge as fellow and tutor of his college (1829-41) and vicar of St. Paul's church (1842-7). On 29 June 1847 he was consecrated first bishop of Melbourne, and was installed there in St. James's cathedral on 28 January 1848. At his arrival there were only three Anglican clergy in the Port Phillip district; within a few years his diocese was the centre of the gold-rushes, and, having to create amid that turmoil a system of Church organization, he initiated in Australia the modern practice of government through an assembly composed partly of clergy and partly of laymen elected by the parishes. During his episcopate he stimulated the building of more than 300 churches in the diocese. In 1874 he returned to England, and in 1876 resigned the see; after a short holiday he became in 1878 chaplain to the order of St. Michael and St. George and prebendary and canon of Llandaff. He retired in 1889 and died on 2 December 1891. See CHURCH OF ENGLAND.

Perth, the capital of Western Australia, lies in latitude 31° 57′ S. and longitude 115° 50′ E. on the banks of the Swan River about 10 miles from its mouth. The site was chosen by Captain James Stirling (q.v.) when the colony was established in 1829, and the town was named Perth after the old capital city of Scotland and in honour of Sir George Murray, at that time secretary of state for war and the colonies, who was born in Perthshire and sat for that county in the house of commons. The town was founded on 12 August 1829, the birthday of King George IV; a rapid survey of the townsite was then undertaken, and the first allotments were offered for sale on 5 September following. During that month the officials and settlers, who had been temporarily accommodated on Garden Island, moved to the mainland, and by the end of the year the infant city had become a straggling village with a population of about 300.

Its progress, according to modern notions, was extremely slow, but in that it only reflected the progress of the colony generally. By the middle of 1837, eight years after its foundation, over 400 town allotments had been sold, and about 350 houses had been erected; four walls and a roof fulfilled all requirements, and even light and ventilation were secondary considerations. This absence of architectural pretensions was a distinguishing feature of Perth for many years; no attempt was made until after the introduction of the convict-system to replace the crude four-square buildings with anything more ornate. Want of money in those early days hampered progress even in such essentials as road-formation, but in 1840 the first step towards a modern policy was carried out by the construction of a causeway-bridge over the river-flats, thus bringing Perth into closer communication with outlying settlements.

It was not until 1856 that Perth, by the establishment of the bishopric, was constituted a city. Up to that time, and for many years after, local government was in the hands of a body called the 'town trust.' In 1871 a municipal institutions act was passed, and the city came under the rule of a city council; but its presiding officer was still called 'chairman,' until in 1880 he was given the more dignified title of 'mayor.' In 1864 the city was divided into three wards, and in 1867 the foundation-stone of the town-hall was laid by Governor Hampton; the building was completed in May 1870, and opened by Sir Frederick Weld.

Up to this time Western Australia had lagged behind the rest of the civilized world in modern facilities; in January 1869 there was not a single mile of telegraph-line or railway in the colony. In that year two private citizens, Messrs. Stirling and Cumming, erected a private telegraph-line between Perth and Fremantle, and opened it in June for public business. This stirred the government to action, and by 1872 Perth was connected by telegraph with Albany, Bunbury, and Toodyay. Further extensions were made, and at the beginning of 1875 the first pole of an overland line to Adelaide was erected; the line was completed by the end of 1877, and Perth was brought into telegraphic communication not only with the capitals of the eastern colonies, but through Adelaide with the cable-systems of the world. In June 1879 the first sod was turned of a railway intended to run from Fremantle through Perth to Guildford. This line, opened in 1881, formed the first section of that great network of railways which now connects the capital with practically the whole of the settled area of the State. Telephone facilities were not available in Perth until the end of 1887, but were quickly afterwards extended to Fremantle.

In 1889 a private company began the construction of a water-supply service from a catchment area in the Darling ranges. These works were purchased by the government in 1896 and placed under the control of a board, which in 1909 gave way to a department established to control water-supply, sewerage, and drainage throughout the metropolitan area.

The development of Perth into a modern city —and of Western Australia into a modern State —may be said to date from the gold discoveries of the early nineties. The placid life of the community was upset by the gold-seekers, many of whom came from cities replete with every modern requirement, and were dissatisfied with the antiquated buildings of Perth and the antiquated methods of its rulers. One by one the old-time buildings gave way to modern structures, not always architecturally correct, but on the whole along right lines. With the exception of St. George's-terrace—one of the finest thoroughfares in the Commonwealth—the streets are narrow from the modern standpoint, but the city council and the town-planning association are alive to that fact and are acting in concert to remedy it. The city is admirably provided with lungs—foremost among them being The King's Park, with an area of nearly 1000 acres.

Traffic facilities are met by electric trams and motor-buses (the former controlled by the government), and by a frequent suburban train-service reaching out to Fremantle on the one side and Midland Junction on the other. These facilities have brought into existence a metropolitan area stretching through a distance of over 20 miles east and west, mainly along the northern side of the river. Tram and ferry services, too, are rapidly making the south side desirable for residences. As with all other State capitals, the population of the metropolitan area is growing more rapidly than that of the country; at the end of 1925 it contained 179,388 out of a total State population of 372,183.

With cultural institutions Perth is well supplied. In 1876 a boys' high school was opened with government assistance. In 1889 the public library came into existence to commemorate Queen Victoria's jubilee; the museum and art gallery, sections of the same memorial, were opened in 1895. The university was established in 1911 and opened in temporary buildings in 1913—it is gradually being transferred to a permanent home at Crawley. The first theatre—the Theatre Royal—was built in 1897, and His Majesty's Theatre soon afterwards; others were built later on. The principal concert-hall, Queen's Hall, is owned by the Methodist Church.

FREMANTLE, the seaport of Perth, dates from the arrival of the first immigrant-ship in 1829. During the course of that year nearly a score of ships arrived at Swan River, and the port assumed the proportions of a town more quickly than the capital itself. The first gaol was erected there in 1830, the first newspaper published in the colony was issued there in 1831, and the first horse-race run in 1833. A regular service of boats was soon established from

Fremantle through the capital to Guildford; though a bush-track between the port and Perth existed almost from the beginning of the colony, no definite road was made until 1845. In 1850 Fremantle became a landing-place for convicts, and most of the buildings required for the convict administration were erected there. Railway communication with Perth was established in 1881, in 1883 the town became a municipality, and its town-hall was opened in 1887. Harbour improvements were commenced in 1892, and in 1898 were so far complete that large steamers berthed within the mouth of the river. In 1906 electric tram and lighting services were initiated by the municipality. The town-hall and the Anglican, Roman Catholic, and Methodist churches have some architectural merit.

J.S.B.

Petalostigma, a genus of the family Euphorbiaceae, consisting of one species endemic in Australia, which ranges from New South Wales to Queensland and Western Australia. *P. quadriloculare* (Crab-tree, Native Quince, Emu-apple, Quinine Tree—all these names being shared by other plants) is a moderate-sized tree. The branches, under-sides of the leaves, and small, clustered flowers are clothed with loose silky hairs; fruit orange-coloured, ½ inch in diameter. The stem-bark contains a camphor-like essential oil, and a bitter principle—reputed to have properties like those of quinine—belonging to the glucosides. Brownish-yellow dyes made from the bark have been experimentally used for dying cotton and woollen fabrics. The hard, brownish wood resembles that of the English laburnum; its wavy grain gives it a pleasing appearance when polished.

Peter Peter. See FLYCATCHERS.

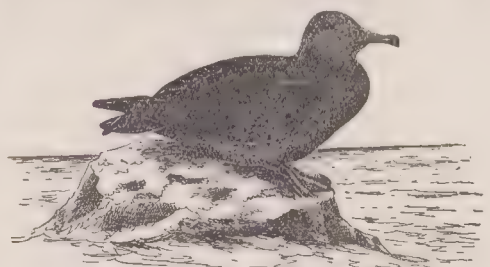
Pethebridge, SIR SAMUEL AUGUSTUS (1862-1918), born at Brisbane on 3 August 1862, educated at state schools in Brisbane and Townsville, and for a time privately, was sent as a boy for health's sake to Cape Bowling-green lighthouse, Queensland. Deriving thence a passionate love of ships, he entered in 1876 the Queensland ports and harbours department, and, subsequently joining the naval brigade of that State, served in the gunboats *Gayundah* and *Paluma* (lieutenant, 1894; commander, 1903). Upon the inauguration of the Commonwealth, being then secretary of the marine department of Queensland, he was chosen as the first chief clerk of the defence department, of which R. Muirhead Collins (afterwards official secretary to the high commissioner in London) was secretary and permanent head. When Collins went to London, Pethebridge succeeded him, and held that position at the outbreak of the war in 1914. He was in November 1914 appointed to command the expedition intended to take over from the Japanese the control of the Marshalls, Carolines, and Ladrones, formerly German possessions in the north-western Pacific. Just before the expedition sailed, a popular movement in Japan caused the government of that country to reverse its decision to give up the islands, and Pethebridge's force was accordingly diverted to the relief of the expedition which, under Colonel William Holmes, occupied German New Guinea. There Pethebridge succeeded Holmes as administrator (colonel, 1914; brigadier-general, 1916) and, until his death on 25 January 1918, largely moulded the policy of the Commonwealth government in relation to the occupied territory.

C.E.W.B.

Petrels, marine birds of the families Hydrobatidae, Procellariidae, and Pelecanoididae, which with the albatrosses (Diomedeidae) constitute the order Tubinares. Members of this order are found throughout the world, and are specially numerous in the southern hemisphere.

Petrels are exclusively oceanic birds; though some do not travel very far from shore, the majority range throughout great areas of ocean. At the breeding-season they assemble in great numbers on islands, excavating burrows in the ground, or selecting crevices among rocks in which the hen-bird lays a single white egg. When at the breeding-grounds they are almost entirely nocturnal; during the day-time one bird may be found in each burrow, but as darkness falls their mates begin to arrive from the sea—throughout the night there is a constant coming and going, the air over the colony being full of birds, while those in the burrows as well as those in flight utter curious, mournful cries. When dawn appears, half the birds leave again for the sea, and silence reigns once more.

By far the best-known of Australian petrels is the Short-tailed Shearwater (*Puffinus tenuirostris*)—commonly known as Mutton-bird—which breeds in immense numbers on the islands of Bass Strait and off the coasts of Tasmania, Victoria, and South Australia. Flinders calculated that a flock seen by him in Bass Strait, contained 132 million birds. The population of Cape Barren Island is entirely dependent on mutton-birds for its livelihood; over half a million young birds are collected annually and salted for food, the great majority being sent to Melbourne and Sydney for sale. The Bass Strait mutton-bird is a sooty-brown petrel of moderate size. Several other species with similar coloration and habits occur on other parts of the Australian coast-line, though at present they are not utilized for food. All the mutton-birds are members of the genus *Puffinus* and of the family Procellariidae. Other members of the



Mutton-bird (*length* 14 *in.*).

same family that breed on the Australian coast are the White-winged Petrel (*Pterodroma leucoptera*), which nests beneath the tangled scrub vegetation on Cabbage-tree Island in Port Stephens, and the little gray-blue Dove-petrel (*Prion turtur*), which nests in crevices among rocks on the islands of Bass Strait. Others, again, are seen in Australian seas chiefly during the winter, though their breeding-grounds are farther to the south. Of these the Giant Petrel (*Macronectes giganteus*) is nearly as large as an albatross. This species is usually of a uniform sooty-black colour, but some individuals are almost entirely white; yet they are not albinos,

since their eyes are of the normal colour and they generally have a number of dark feathers scattered through their plumage. The white form is rare in Australian seas, but becomes commoner towards the Antarctic continent. Another petrel of this family, familiar to voyagers, is the so-called Cape Pigeon (*Daption capense*), whose chequered black-and-white plumage is unlike that of any other bird.

Of the Hydrobatidae (storm-petrels, Mother Carey's chickens) several species occur in Australian seas, but only one, the White-faced Storm-petrel (*Pelagodroma marina*), is known to breed within their limits. There is a large colony of these little birds on Mud Island in Port Phillip, and other colonies inhabit islands along the southern half of the Australian coast.

The diving-petrels (Pelecanoididae) are represented in Australian seas by a single species (*Pelecanoides urinatrix*), which breeds among rocks on the islands of Bass Strait and Tasmania.

W.B.A.

Petrie, ANDREW (1798-1872), born in Fifeshire, Scotland, in June 1798, was induced to migrate to New South Wales in 1831 on the representations of Dr. Lang (q.v.). He worked in Sydney as a civil engineer, and in 1837 was sent to Moreton Bay as government superintendent (clerk of works), travelling by the *James Watt*, the first steamer to enter what are now Queensland waters. He subsequently became the builder of a large portion of early Brisbane. In 1838, while on an excursion with Major Cotton, the commandant, Petrie and his companions were lost for three days near the present Mount Petrie. In 1842 with Henry Stuart Russell and others he took the first boat along the Mary River and rescued two 'wild' white men—James Bracefield or Bracefell (the blacks called him Wondi, 'great talker'), and a still more remarkable personality, James Davis (Duramboi, 'kangaroo-rat'), a Scot who had escaped from the penal settlement at Moreton Bay as a lad 13 years old, and lived with the aborigines for 16 years. The farewelling of Davis by the blacks on his return to civilization constitutes one of the most dramatic of minor episodes in Australian history; Russell (*Genesis of Queensland*, pp. 284-5) records that when Davis embarked blacks appeared from behind every tree and wailed piteously, while Davis stood quivering in the boat and shouting them a promise to return in three months—'when the moon has come back to you three times, I shall be here.' (See WILD WHITE MEN.) Petrie (in 1838) was the first to discover the bunya-bunya pine (see PINES), which according to Russell was in Brisbane named *Pinus Petriana*. J. C. Bidwill (q.v.) afterwards brought in the first seedlings and sent them to Kew Gardens, London, where they were classified as belonging to the genus *Araucaria* and officially named *A. Bidwilli*. For the last 24 years of his life Andrew Petrie was blind; he died at Brisbane in February 1872. Petrie's Bight on the Brisbane River is named after him.

A.H.C.

Petrie, THOMAS (1831-1910), best-known son of the above, was born in Edinburgh and brought when three months old to New South Wales. From early childhood Petrie fraternized with the aborigines and learned to speak their languages; ultimately he became well known to thousands of wild blacks and was granted privileges extended to no other man outside the tribes. He frequently prevented conflict between whites and blacks, having firm faith in the goodwill and reliability of the aborigines if kindly treated; and sometimes alone, sometimes with Davis, he did valuable work in opening up tracks through the ranges. He was the only white man (except a few escaped convicts like Bracefield and Davis) allowed to be present at feasts of the bon-yi (bunya nut); when a boy of 14 he 'went bush' with a tribe for a fortnight on one of these picturesque picnics. Gifted with a remarkable memory for detail, in his later years he related his experiences with the aborigines, and a wealth of information concerning their customs, to his daughter Constance, by whom they were published as *Tom Petrie's Reminiscences* (Brisbane, 1904). Further information relating to the work of the Petries will be found in H. S. Russell's *Genesis of Queensland* (Sydney, 1888).

A.H.C.

Petroleum. See OIL.

Petrophila, a genus of the family Proteaceae, consisting of extra-tropical shrubs, endemic in Australia and mostly in its western areas. The flowers are white or yellow, collected in cone-like heads; corolla regular, tube slender and separating into 4 petals from the base; anthers free, the connective produced into a small appendage; style surmounted by a brush; fruit a compressed nut, with a tuft of long hairs on the margin enclosed in the persistent woody cone-scales; leaves rigid, entire or divided, flat or cylindrical, and often charmingly decorative.

Phalangers. See OPOSSUMS.

Phanerogams. See BOTANY.

Phaseolus, a genus of the family Leguminosae, consisting of dwarf or twining annuals or perennials, widely distributed in warm regions. Three species are indigenous to Australia, *P. vulgaris*, *P. truxillensis*, and *P. mungo*; the last has yellow flowers, and is known as Green Gram or Mung-bean—names given to it in India, where it has long been cultivated and used as food for man and beast. The flour of the green variety has been used in that country as a substitute for soap. *P. vulgaris* is the French or Kidney Bean of the kitchen-garden.

Phasmidae. See STICK-INSECTS AND LEAF-INSECTS.

Pheasant, Mountain and Native. See LYRE-BIRDS and MOUND-BIRDS.

Pheasant, Swamp. See CUCKOOS.

Phebalium, a genus of the family Rutaceae, consisting chiefly of shrubs with small white or yellow flowers and leaves often clothed with scurfy scales. With the exception of one species in New Zealand, the genus is endemic in Australia. The calyx is 5-toothed; petals 5, with inflexed tips; stamens 10. *P. Billardieri* is a handsome shrub (occasionally a small tree); its leaves are covered on the under-side with minute silvery scales, and its small flowers, produced in pyramidal sprays, make a fine display. It grows in brush gullies, but readily adapts itself to ordinary garden conditions. Its timber somewhat resembles that of red cedar, but is of greater density and lighter colour. *P. dentatum* is an ornamental shrub, with clusters of small yellow flowers, and narrow leaves with blunt teeth on the margin. All species contain a more or less acrid oil; *P. argenteum*, a tall shrub

from south-western Australia, secretes this in such profusion that it is known locally as 'blister-plant.'

Philately. In 1837 Rowland Hill published in England a pamphlet showing that the average cost of conveying a letter or newspaper in Great Britain was about 1½ pence. A copy of this pamphlet reached New South Wales shortly after, and on 7 September 1838 James Raymond, then postmaster-general, wrote to the New South Wales colonial secretary in the following terms:—'Having attentively perused the suggestions of Mr. Rowland Hill on the subject of introducing stamped covers as a means of simplifying and effecting a reduction in postage, I have endeavoured to perfect an envelope which I do myself the honour to submit for the inspection of His Excellency the Governor.' Raymond's plan was to sell to the public at 1d. each sheets of paper impressed with the seal of the general post-office; a letter written on one of these sheets could be folded and sealed, and would then be passed through the post-office for distribution within the town delivery of Sydney, free of any other charge. As the town postage-rate was at that time 2d., Raymond's proposal was to reduce the postage by one-half and supply paper free. Governor Gipps minuted the paper 'Let the experiment be tried, but the price must be fixed at 1½d. the single cover, or 1s. 3d. per dozen.' The public were informed of the adoption of the stamped cover by *Gazette* notice dated 1 November 1838. New South Wales therefore put into practical operation the two great principles of Rowland Hill's reform nearly two years before Britain issued the first adhesive stamp and stamped envelopes (May 1840). In January 1841 the price of the New South Wales letter-sheet was reduced to 1s. per dozen or 8s. per 100; these postal conveniences remained in use until the issue of adhesive postage-stamps and the introduction of compulsory prepayment of postage in 1850.

These innovations were authorized on 12 October 1849. Little time was available for preparing dies for the postage-stamps, but Raymond obtained from local engravers tenders for engraving plates. The work was eventually entrusted to three artists, Robert Clayton furnishing a copper plate containing 25 engravings of a penny stamp, John Carmichael a copper plate containing 24 engravings of the twopenny stamp, and H. C. Jervis a copper plate containing 25 engravings of the threepenny stamp. From these plates a supply of stamps was printed by Charles Kay of Union-street, Sydney, under the supervision of a board consisting of the auditor-general, the colonial storekeeper, and the postmaster-general. The stamps, gummed and ready for use, were issued to the public in time for employment in prepaying postage on 1 January 1850. The design adopted for all three values was an adaptation of the reverse of the colonial seal (see SEALS AND ARMORIAL BEARINGS), the original medallion for which had been modelled by Josiah Wedgwood in clay sent to him from Australia. Collins (*Account of the English Colony in New South Wales*, 1804) describes the reverse of the seal as 'a representation of convicts landing at Botany Bay, received by Industry, who, surrounded by her attributes—a bale of merchandise, a beehive, a pickaxe, and a shovel—is releasing them from their fetters, and pointing to oxen ploughing, and a town rising on the summit of a hill, with a fort for its protection. The masts of a ship are seen in the bay.' The inscriptions were '*Sigillum Nov. Camb. Aust.*' with the motto '*Sic fortis Etruria crevit*' beneath the central design.

The penny stamp was printed in red; the twopenny in blue, and the threepenny in green.

Early stamp-collectors (1860-2) imagined that the design of these stamps represented a view of Sydney, and that they were used only for local postage. They were termed 'Sydney Views,' and are still colloquially known by that name. The issue enjoyed a brief existence, being replaced in 1851-2 by stamps bearing a portrait of Queen Victoria with a laurel wreath; this series is known as the 'laureated' issue, and consisted of the same denominations as the first issue with two additional values—sixpence, and eightpence, printed in brown and yellow respectively. The plates of the 1d., 2d., and 3d. were of steel, containing 50 engravings each. The 6d. and 8d. plates were of copper, the former containing 25 and the latter 50 engravings. John Carmichael engraved the first four values, and H. C. Jervis the 8d.

These two issues have long held the highest place in the esteem of philatelists, not only on account of their quaint designs, rich colouring, and comparative rarity, but because there are as many varieties of type as there were engravings on a plate—the most skilful engraver cannot exactly reproduce any design in hand-engraving. In 1865 Edward L. Pemberton published an article describing and differentiating the main varieties of the 1d. and 2d. Sydney Views; during 1867-9 he published other articles showing that many different plates had been engraved. In 1878 Dr. Legrand proved that there were two plates of the 1d., each containing 25 types, the first plate being described as 'without clouds' and the second 'with clouds' (the 'clouds' were lines of shading in the space above the 'view'). M. P. Castle in 1884 described five plates of the 2d., and arranged them in the correct order of issue. In 1887 T. K. Tapling in collaboration with Judge F. A. Philbrick reconstructed all the plates of the Sydney Views from single stamps, pairs and blocks; the 1d. plate, they found, contained 25 types, arranged in five horizontal rows of five stamps. This plate, however, had been entirely re-engraved, the position of the stamps remaining relatively the same, but the details of the design being so altered, as, together with the insertion of 'clouds,' to constitute an easily distinguishable group of 25 types. The 2d. plate was found to contain 24 types arranged in two horizontal rows of 12 stamps; engraved at first with vertical lines in the spandrels, it was at an early date re-engraved, the lines being horizontal. Three subsequent re-engravings of the same plate were all reconstructed, each showing features common to every stamp on the plate, but differentiated from the preceding or following plates. The 3d. plate was shown to contain 25 types arranged in five rows of five, as in the case of the 1d. This plate was not re-engraved. Further, the authors listed and described the numerous varieties of paper on which the various plates were printed, and the shades of colour associated with each plate and paper. These results were published by the Philatelic Society of London in its catalogue of the *Stamps of Oceania* (1887), accompanied by autotype illustrations of the reconstructed plates. Subsequent investigations by Dr. Houison and A. F. Basset Hull (who had the advantage of access to official records in Sydney) established beyond all doubt the accuracy of the work of the European philatelists.

For the Laureated series Tapling and Philbrick correctly reconstructed the plate of the 1d.; showed that there were two plates of the 2d., one steel and the other copper, and that the steel plate was wholly re-engraved, all three plates being reconstructed; correctly placed the 50 types of the 3d. plate; showed that there were an original and a re-engraved plate of the 6d.; and, with one or two errors in relative position, reconstructed the plate of the 8d. Years later the original plates of the 2d. (copper), 6d. and 8d. were discovered, and impressions taken from them showed the correctness of Tapling and Philbrick's arrangements, with slight discrepancies in the 8d.

The locally engraved and printed stamps of New South Wales included also a registration label, produced in two colours from two steel plates—one of the central portrait of the Queen, and the other of the inscribed label—engraved by John Carmichael; there were 50 stamps to the plate, all varying in minute detail. This plate also was reconstructed by Tapling and Philbrick, the subsequent discovery of the original plate showing that only two stamps had been misplaced. Registration stamps were first issued in 1856, and the distinctive stamp was withdrawn in December 1867.

The method of producing stamps by hand-engraving on copper or steel plates was unsatisfactory for two reasons—first, the impossibility of uniform reproduction of design, second, the slow process of printing from small plates. Steps were taken early in 1852 to obtain from England steel plates containing mechanically reproduced impressions, and in February 1854 stamps of 6d. and 1s. were printed in the colony from plates engraved by Perkins, Bacon & Co. of London. During the two following years additional values of 1d., 2d., 3d., 5d., and 8d. were issued. The three lower values were of the ordinary size, but the higher values were large square stamps of ornate design and elaborate engraving; all bore a portrait of the Queen in profile, wearing a diadem. This series is known as the 'Diadem' issue, and its philatelic interest is largely due to the fact that it was first issued imperforate, and was subsequently perforated. The paper on which these stamps were printed bore as watermarks double-lined figures corresponding to the value of the stamp printed thereon. This safeguard against forgery had been initiated early in 1854, the three lower values of the laureated series having been printed on paper watermarked with the figures 1, 2, and 3; in printing the diadem series, paper with the appropriate watermark was used until a shortage occurred, and then some printings of the 2d., 6d., and 1s. were made on paper designed for other values—the 6d. with watermarks 5, 8, and 12, the 2d. with watermark 5, and the 1s. with watermark 8. These varieties are not errors—they were officially authorized as emergency printings. On the other hand there are three varieties of watermark which, from their extreme rarity and the fact that no record of their authorization can be found, may properly be classed as errors. These are the 2d. with watermark 1 and 8, and the 3d. with watermark 2. Probably only one sheet of each was printed.

The designs of the square stamps were adapted from sketches supplied by S. Levinge, a clerk in the Sydney post-office. When in 1859 it was proposed to provide a 5s. stamp, Levinge prepared a highly ornate design, and expressed a hope that the design would be adhered to, however much the drawing might be improved upon. The engraving was entrusted to Perkins, Bacon & Co., who produced a beautiful die, but transformed a waratah into a combination of the rose, shamrock, and thistle. The 5s. stamp was printed in the colony from the steel plate engraved in England, and was issued in 1861. In the same year an electrotype die and plate for printing 2d. stamps were ordered from De la Rue & Co., London, and the first supply of stamps was printed, gummed, and perforated by the engravers; later supplies were produced at the government printing-office at Sydney. This value was followed by others at intervals, denominations of 1d., 4d., 10d., 6d., and 1s. appearing between 1864 and 1876. The steel dies were in each case engraved by De la Rue & Co.; and the first plates of the three first-mentioned values and the 1s. were sent out with the dies. The 6d. plate was made at the government printing-office at Sydney. Subsequent issues for New South Wales were engraved in the colony, and printed from locally made electroplates at the government printing-office. A temporary issue of high-value stamps was made in 1885, the long rectangular 'Stamp Duty' stamps of 5s., 10s., and £1 (engraved by De la Rue & Co.), being overprinted with the word 'POSTAGE,' issued primarily for prepayment of telegrams, and subsequently pressed into general postal use.

In 1888 the centenary of the colony was commemorated by the issue of a new series of postage-stamps. The designs were selected from a number sent in by local artists in response to an advertisement issued by the postmaster-general. The dies were engraved and the electroplates prepared by the government printer at Sydney. Each of the 'Centennial' stamps bore a different design, although the words 'One hundred years' were common to all.

With the introduction of universal postal union rates at the end of 1890, it became necessary to provide several new denominations. For the 2½d. value a die and plate were engraved by the government printer, the design being symbolical of the world-wide ramifications of the union; the other values were produced by printing from the recently obsolete De la Rue plates in distinctive colours, with the new denomination indicated by an overprint in black. The first surcharged stamp of this colony was the 9d. of 1871, which was made from the 10d. plate, printed in a different colour and overprinted 'NINEPENCE.' In 1897 a series of three stamps was issued to commemorate Queen Victoria's diamond jubilee; dies and plates were engraved at the government printing-office. A vote of philatelists gave this New South Wales 2½d. stamp the distinction of being among the ugliest in the world. In the same year special stamps were issued at 1s. and 2s. 6d., the difference between the postal value (1d. and 2½d. respectively), and the sale-price being devoted to the funds of the local hospitals. These were large stamps of highly ornate appearance, produced by lithography at the government printing-office.

Victoria. Although the Port Phillip district was not officially separated from the parent colony until 1 July 1851, distinctive postage-stamps bearing the legend 'Victoria' were issued in January 1850. The design consisted of a half-length portrait of Queen Victoria, holding the orb and sceptre. Dies for three values of 1d., 2d., and 3d. were engraved on a steel plate by Thomas Ham, a local engraver, who made lithographic transfers from the dies, and printed

the stamps by that process. The die of the 2d. was twice re-engraved in certain details of border or background, and these constitute the only types properly so called. In the process of making the transfers and laying them on the lithographic stones Ham and subsequent printers produced a number of varieties, resulting from defective impressions, repairs, etc., all of which have been described in detail by philatelic writers. The 'half-length' series was followed in 1852 by a larger 2d. stamp, bearing a full-length picture of the Queen on a throne, with the value in words beneath; the name of the colony was omitted. The plate was engraved by Ham on copper, and contained 50 stamps, all of which differed in type, there being a letter in each lower corner so arranged that no two stamps contained the same two letters. In 1854 stamps were lithographed from transfers made from this plate. In 1854-5 two stamps for special service were issued, one for registered letters, value one shilling, and the other for too-late letters, value sixpence; these were engraved locally on boxwood by Samuel Calvert, and printed in two colours. In 1854 ordinary postage-stamps of 6d. and 2s. were engraved and printed by Calvert, and a 1s. stamp of small octagonal shape was lithographed by Campbell and Ferguson. In 1856 two steel plates were engraved by Perkins, Bacon & Co. of London, the design being 'Queen on Throne' with the name of the colony above; the values were 1d. and 6d., and a supply of stamps was printed on paper watermarked with a star, and sent out with the plates—which, however, were never used for printing in the colony. A series bearing a portrait of the Queen in profile, with sheep, a ship, and other emblems of colonial industry in the corners, known as the 'Emblems,' was engraved and printed from electroplates by Calvert Brothers of Melbourne.

Numerous issues followed, the dies being engraved locally and electroplates made at the government printing-office, with two exceptions; these were the laureated series of 1863-4, the plates of which were made by the government printer at Sydney, and the 2d. of 1870, the die of which was engraved by De la Rue & Co. in London. In 1885 stamps formerly issued for payment of stamp duties were rendered available for postage, and a new series of stamps from ½d. to 1s. 6d. was issued, bearing the inscription 'Stamp Duty,' but available for both postal and fiscal purposes.

In 1853 *Tasmania* issued postage-stamps, two plates for values of 1d. and 4d. being engraved on copper by C. W. Coard, and printed at the *Hobart Town Courier* office on unwatermarked paper. These were quaint designs, having a small profile of the Queen in the centre, surrounded by the name 'Van Diemen's Land' and the value in words. The 1d. was rectangular with hollowed corners, the 4d. octagonal. Of the higher value two plates were engraved, differing slightly in detail. All three plates contained 24 types which are easily plateable. These were followed in 1855 by handsome stamps of 1d., 2d., and 4d., engraved on steel and printed from steel plates by Perkins, Bacon & Co. of London on paper watermarked with a star. The plates were sent out with the English-printed stamps, and thereafter supplies were printed locally, first on unwatermarked paper and later on paper specially manufactured in England bearing watermarks of figures corresponding with the values. In 1856 the name of the colony was changed to 'Tasmania,' and two new stamps of 6d. and 1s. were engraved on steel by the London firm, supplies printed on paper watermarked 6 and 12, being sent out with the plates, from which supplies were subsequently printed locally. There were thus five denominations in use up to 1870, three bearing the old and two bearing the new name of the colony. Although the issues up to 1869 were unperforated, many firms had their sheets perforated or rouletted; a number of varieties of these unofficial perforations exist. In 1870 De la Rue & Co. of London were commissioned to prepare electroplates for stamps of 1d., 2d., 4d., and 10d.; these were sent out to the colony, and supplies were printed from them on paper, borrowed from New South Wales, bearing small figures of value as watermarks. Later a paper was imported bearing the letters 'T A S' as a watermark, and values of 3d., 9d., and 5s. were added. In 1878 the 1d. and 2d. stamps, together with a new value of 8d. were procured from De la Rue & Co. The postal union rates necessitated the adoption of two new values in 1889-91, and ½d. and 2½d. stamps were produced by overprinting those values on the 1d. and 9d. stamps respectively. A permanent ½d. die and electroplate were procured from Victoria, and the stamps were printed locally. In 1892 a new design was adopted, having a small portrait of the Queen in ornamental frame as a 'key' plate for all values, with the denomination printed in a cartouche in another colour. This series of ten values from ½d. to £1, was electrotyped and printed by De la Rue & Co. In 1896 a handsome set of pictorial stamps was issued, printed from engraved plates by De la Rue & Co.; these were of large size, and illustrated some of the most beautiful island scenes. Later, supplies were printed in the colony, both from the English-made plates, and from local zincograph reproductions.

In 1879 postal and fiscal stamps were made available for either purpose, and fiscal stamps of 1863 (with a design of St. George and the Dragon, copied from the sovereign) were authorized for postal use, as well as the 'stamp duty' series, engraved and printed by De la Rue & Co., which had for design a platypus on the bank of a stream.

Western Australia issued its first postage-stamp in August 1854; it was engraved on steel by Perkins, Bacon & Co., the design being a swan swimming to the left in an oblong inscribed frame. The first supply was printed by the engravers in black. New values of 4d. and 1s. were made in the colony by the government printer, who took lithographic transfers of the swan, and enclosed it in an octagonal frame for the 4d. and an oval frame for the 1s. A transfer of the 4d. had the frame inverted; a few of these stamps, known as the 'Inverted Swan,' are still in existence, and as much as £800 has been paid for a used specimen. Two more values, 2d. and 6d., were lithographed at the government printing-office in 1857, and in 1860 printings were locally made from steel plates engraved in London, of 2d., 4d., and 6d. denominations. The local efforts not being deemed altogether satisfactory, Perkins, Bacon & Co. were commissioned to print supplies up till 1864; the contract was then transferred to De la Rue & Co., who printed from Perkins, Bacon & Co.'s steel plates for many years. In 1872 a new value of 3d. was added, the die and electroplate being made by De la Rue & Co. Between 1885 and 1893 the steel-plate stamps were gradually superseded by De la Rue's electrotyped stamps—bright-coloured prints with design of a European swan. In

this colony, also, revenue stamps were authorized for postal use, and the two telegraph-stamps were also utilized.

The first postage-stamps of *South Australia* were issued in January 1855. They were engraved on steel by Perkins, Bacon & Co., the design consisting of a diademed portrait of the Queen on an engine-turned background. These stamps were first printed by the engravers on paper watermarked with a large star; the colours were very rich, and the stamps were issued imperforate. Later supplies were printed in the colony and issued imperforate, rouletted, and perforated in successive years. The English-printed values were 1d., 2d., and 6d. Plates for 1s., 4d., 9d., and 2s. values were subsequently supplied, and stamps were printed therefrom in the colony. New values were created by using different colours and overprinting the 9d. 'TEN-PENCE,' the 4d. '3-PENCE,' and the 9d. '8-PENCE.' The steel-plate stamps were to some extent superseded by an issue engraved and electrotyped by De la Rue & Company, and printed in the colony on paper watermarked with a crown over the letters S.A. In 1887-93 stamps of new types inscribed 'Postage & Revenue,' were issued for both postal and fiscal use. The series ranged up to £20, and the denominations from 2s. 6d. upwards were large rectangular stamps with a portrait of the Queen in the centre. In 1894 two stamps were designed by Tannenberg of Melbourne, and the plates made by Sands & McDougall of that city. The values were 2½d. and 5d., the designs comprising a small portrait of the Queen, and (*a*) a kangaroo (2½d.), (*b*) the colonial arms (5d.).

Queensland was the last of the colonies to issue postage-stamps. Separated from New South Wales by an order-in-council dated 6 June 1859, the 'Moreton Bay district' was erected into a colony; but the stamps of New South Wales were purchased at cost of printing and issued by the postal department of the new colony until distinctive stamps could be procured from England. Perkins, Bacon & Co. engraved the dies and prepared the steel plates, printing the first supplies of 'Queensland' stamps on star-watermarked paper; these consisted of 1d., 2d., 3d., 6d., 1s., and registered stamps, the design being an elegant full-face portrait of Her Majesty in an inscribed oval with engine-turned spandrels. The plates were sent out with the stamps, three values being issued in 1860, and subsequent supplies were printed in the colony on both plain and variously watermarked papers. In 1866 two new values, 4d. and 5s., were produced by lithography from impressions from the steel dies of 3d. and 1s. The alterations in the values were made by hand on the stone, and there are many varieties in the lettering. In 1879 a die for producing electrotypes was engraved by W. Bell of Sydney, electros were made by W. Knight of the government printing-office at Brisbane, and from these 1d. and 2d. stamps were printed. The design was a crude profile portrait of the Queen in inscribed oval. Owing to the primitive means at Knight's disposal, the electros were prepared in groups of four, showing varieties of type and lettering. These two stamps were followed by 4d., 6d., and 1s. values of the same design. In 1881 more high values (2s., 2s. 6d., 5s., 10s., and 20s.) were produced by lithography from transfers from the original 1s. die. These stamps were available for both postal and fiscal use. In 1882 a steel die for a 2d. stamp was procured from Bradbury, Wilkinson & Co. of London. From this die electroplates for 1d., 2d., 4d., 6d., and 1s. values were prepared by Knight, the plates being made up of groups of four as in the previous issue; numerous varieties of type exist. In the same year a set of five steel plates was procured from the same English firm for printing the values from 2s. to £1. The stamps were of strikingly handsome design and elaborate execution, the full-face portrait of the 1860 stamps being repeated, and the remainder of the design consisting of inscriptions, figures of value in each corner, and fine ornamental details of engraving; the colours also were rich. During 1887-1900 values of ½d., 2½d., and 5d. were added, and several alterations in the general design of the other values were made, figures of value being added in the angles, and the shaded background being removed from the central portrait.

With the issue of the postage and revenue high values in 1881 the then current 'stamp duty' series was authorized for postal use, and advantage was taken of the opportunity to use up for postage any unused examples of the obsolete duty-stamps.

When in 1901 all postal and telegraphic services were transferred to the Commonwealth, the distinctive State stamp-issues were still retained, as this facilitated the working of a clause in the constitution which provided that for ten years the accounts of the six States must be kept separately. Stamps were issued through the Commonwealth post-offices, but as a rule each State printed its own, and the stamps of any one State were not valid in another. Two stamps, value 9d., were issued with the inscription 'Commonwealth,' but each bore in addition the name of the State (New South Wales or Queensland) for which it was valid. In 1912, however, the statutory period having elapsed, stamps of any State were made valid throughout Australia, and it became possible to use, say, Victorian stamps to frank letters from Queensland to Western Australia; collectors took a delight in making varied combinations to illustrate the validity of all issues everywhere.

In January 1913 appeared the first general Australian issue, engraved locally and printed from electroplates at the government printing-office in Melbourne—the design being an outline map of Australia on a shaded background, with a kangaroo in the centre. The series comprised 15 denominations ranging from ½d. to £2, the four highest values being printed in two colours. Exception was taken to the design in some quarters because it did not follow the usual colonial pattern by including the head of the reigning monarch; consequently in December 1913 (a new ministry having come into power) a penny stamp was issued bearing the head of King George surrounded by wattle-blossom, with a kangaroo and an emu at the sides. The first issue (one million) was printed from an engraved steel die, and to prevent speculation among collectors it was ordered that no buyer should be supplied with more than six; enterprising collectors visited all the offices within reach and secured a quota at each, so that the restriction effected little. It was intended to extend this series through all existing denominations, but a second change of ministry and the outbreak of war put an end to all ambitious plans, and the only other steel-engraved issue was a 6d. stamp bearing a kookaburra. The new penny stamp was afterwards issued with a slightly altered design printed from electroplates, and ½d., 1½d., 2d., 2½d., 4d., 4½d.,

5d., and 1s. 4d. stamps of the same design followed, but for all other values the kangaroo type still stands.

In the history of Australian philately probably the most important events have been the donations by Henry Luke White (q.v.) of Belltrees to the Mitchell Library in Sydney; in June 1917 he gave his New South Wales collection, and in 1923 his collections of Queensland, Tasmanian, and Western Australian stamps, a moderate valuation of the whole being £30,000.

See Basset Hull's *Stamps of Tasmania* (1890) and *Postage Stamps of New South Wales* (1911), and Houison's *History of the Post Office* (1890). Of the many philatelic journals the *Australian Philatelist* is probably the most informative. It has recently ceased to exist, but the *Australian Stamp Journal* is still current. A.F.B.H.

Phillip, ARTHUR (1738-1814), born in London on 11 October 1738, was trained for the naval service at Greenwich, in 1753 was apprenticed aboard a ship trading to Greenland, and in 1755 joined the navy (midshipman, 1755; lieutenant, 1762; commander, 1779; captain, 1781; rear-admiral, 1801; vice-admiral, 1809). He saw service in the Mediterranean with Byng's disastrous expedition, and also in the West Indies, particularly at the capture of Havana. In 1763 he went on half-pay, and farmed land in the outskirts of the New Forest. When war broke out between Spain and Portugal in 1774 he offered his services to Portugal, and during the next four years earned encomiums from the Portuguese government; the outbreak of the war with France in 1778 brought him back to England, and to service with various squadrons in British and East Indian waters. In 1784 he was again on half-pay, but in 1786 was chosen by Lord Sydney—then secretary of state for the home department—to lead the expedition destined for Botany Bay.

The reason for this choice is not clear—Howe, the first lord of the admiralty, was captious about it—but its justification was complete. On 24 October 1786 Phillip hoisted his flag as commodore in H.M.S. *Sirius*, and from that moment devoted himself wholly to assuring the success of the expedition. No detail was too small, nor was any suggestion too vague, to escape his close attention; every difficulty which he propounded to his superiors was accompanied by a proposal for its solution. The *Historical Records of New South Wales* (vol. 1, part ii) include a mass of letters and memoranda wherein, among notes about saddles for explorers and grindstones and small tin lamps for presenting to native chiefs, there occur at intervals such aphorisms as:—

> I would not wish convicts to lay the foundations of an empire. . . . The laws of this country will, of course, be introduced in [New] South Wales, and there is one that I would wish to take place from the moment his Majesty's forces take possession of the country: That there can be no slavery in a free land, and consequently no slaves.

His solution of the capital punishment problem is also noteworthy: 'I would wish to confine the criminal till an opportunity offered of delivering him as a prisoner to the natives of New Zealand, and let them eat him. The dread of this will operate much stronger than the fear of death.'

On 12 May 1787 the 'First Fleet,' which had been assembled off Portsmouth, set sail and passed the Needles bound for New South Wales—which appeared on Phillip's chart as New Holland. The fleet consisted of H.M.S. *Sirius* (on which Phillip had John Hunter as 'second captain'), H.M. armed brig *Supply*, the transports *Alexander, Scarborough, Charlotte, Friendship, Lady Penrhyn,* and *Prince of Wales,* and the victualling ships *Borrowdale, Golden Grove,* and *Fishburn,* carrying provisions, tools, and equipment. On arrival at Botany Bay Phillip was to take up the office of captain-general and governor-in-chief of New South Wales; he had on his ship, as lieutenant-governor designate, Major Robert Ross in command of 197 marines. The outward voyage is described under FIRST FLEET. Phillip in the *Supply* (to which he had transferred himself) reached Botany Bay on 18 January 1788, and went ashore on the northern side immediately on arrival. He was met by a party of armed natives, who responded to his signs of friendship by throwing down their weapons and accepting presents of beads and red baize. An examination of the bay, with its low-lying and marshy shores, convinced him that it was unsuitable for a settlement. Accordingly he placed Ross in charge there, and on 22 January, taking Hunter and other officers, set out on a boat-expedition to examine Port Jackson—which had been named by Cook as he sailed along the coast, and described in his journal as 'a bay or harbour in which there appeared to be a good anchorage.' Examining the several coves as rapidly as possible, Phillip fixed upon one which had the twofold advantage of deep water close to the shore and a running stream of fresh water. This he named Sydney Cove. He returned to Botany Bay on 24 January and saw to his astonishment two ships under the French flag beating up off the mouth of the bay. They proved to be the *Boussole* and the *Astrolabe* on a voyage of discovery under the command of La Pérouse (q.v.). Phillip, however, was in a hurry to get back to Port Jackson, and left the visitors to be dealt with by Hunter and King; he himself went on board the *Supply* and took her round to Port Jackson on 25 January, leaving Hunter to follow with the transports on the morning of the 26th. On that day a party was landed in Sydney Cove, the British flag was unfurled, toasts were drunk, and volleys fired. The formal proclamation of the colony did not take place until 7 February.

Poor soil and inefficient labour hampered Phillip in his efforts to make the settlement self-supporting. Writing to Evan Nepean, the under-secretary to the admiralty, he declared that 'if fifty farmers were sent out with their families they would do more in one year to render the colony independent of the mother country than a thousand convicts.' That letter contained the first suggestion for the importation of free emigrants. At first Phillip lived in a canvas house which he had brought out with him; afterwards a stone house was built for him on a site now in Bridge-street. Brick houses were constructed for the officers, log huts, plastered, for the convicts, and barracks for the soldiers; a hospital was also built.

From the outset Phillip was confronted with the food-problem. On 14 February he sent Lieutenant King in the *Supply* with a party of soldiers and convicts to form a settlement at Norfolk Island, which had been discovered by Cook; during the voyage Lieutenant Ball, in command of the *Supply,* discovered a small island 440 miles east of Sydney, named it Lord Howe Island, and annexed it to New South Wales—of which it is still a dependency. The settlement of Norfolk Island left Phillip with

fewer mouths to feed in Sydney, but on the thickly-wooded shores of Port Jackson he found no land suitable for cultivation. In quest of cultivable land he sailed along the coast to Broken Bay (q.v.) in March 1788; he expected to find a great river flowing into it (as indeed there is), but heavy rains compelled him to return to Sydney Cove without penetrating the estuary. His other exploring journeys are described under EXPLORATION BY LAND. But little land of agricultural value was discovered, the convict labourers were indolent and sometimes recalcitrant, and the spectre of famine appeared in the first year of the settlement. In June the few head of cattle strayed and were lost; most of the other imported live stock were already dead; this was possibly no great loss, as in September Phillip reported that the colony was not in a state to support any considerable quantity of live stock, and that his supply of seed-wheat for the coming year was miserably deficient. From that time to the arrival of the transport *Lady Juliana*, followed by the *Justinian*, in June 1790 famine was always impending. Phillip cut down the rations of salt pork, flour, and rice—which in any case, having been brought out with the expedition, were almost unfit for food—and sent the *Sirius* to the Cape for provisions. She brought back a small quantity of flour, but narrowly escaped shipwreck on the voyage. He then determined to send her to China for food as soon as she returned with the *Supply* from Norfolk Island—but she never returned, being wrecked on the island. Hunter and the crew were saved. Rations at Sydney Cove were cut down for every man, including the governor. Phillip collected a party of convicts, provided them with muskets, and sent them out into the bush to shoot kangaroos—they shot three in three weeks. He sent other convicts to catch fish—but had to put armed guards in every boat to prevent the ravenous fishermen from eating their catch. He then sent Lieutenant Ball in the *Supply* to Batavia for provisions, and by her forwarded despatches to London apprising the British ministry of his desperate situation. The stock of provisions dwindled fast. The people grew so weak from want of food that they could not work, and several died of starvation. Phillip hung on grimly. On 3 June 1790—two months after the *Supply* had sailed—the *Lady Juliana* arrived from London with a cargo of flour and a consignment of prisoners. Her master reported that the 44-gun ship *Guardian*, with provisions and stores, had collided with an iceberg south of the Cape; Lieutenant Riou had navigated her back to Cape Town, and transferred his flour to the *Lady Juliana*. A fortnight afterwards the *Justinian* arrived with a full cargo of provisions, and the famine was over. The *Guardian* reached Sydney shortly afterwards with the transports of the second fleet.

Phillip's attitude towards the aborigines was well defined by Bradley: 'the Governor's plan with respect to the Natives, was, if possible, to cultivate an acquaintance with them without their having an Idea of our great superiority over them, that their Confidence and Friendship might be more firmly fixed.' Tench, commenting on the comparative failure of the plan, asserts that 'all ranks of men have tried to effect it, by every reasonable effort from which success might have been expected . . . in the higher stations this has been eminently conspicuous.' Phillip began by effecting in December 1788 the capture of a native named Arabanoo, whom he placed in his own house and endeavoured to train as an interpreter, but lost through smallpox in the following May just as he was beginning to be useful. In November 1789 two other natives, Colebee and Bennelong, were captured, but both escaped; in the summer of 1790 they were seen at Manly, and Phillip with Collins and Waterhouse went there by boat to parley with them. While he was speaking to Bennelong an old black named Willemering—who apparently thought that the whites were about to capture others of his people—advanced with threatening gestures towards Phillip, who continued to walk forward calmly. The black threw a spear; the barbed point struck Phillip above the collar-bone, and came out at his back; whereupon the party, being unarmed, retreated to the boat amid a shower of spears that luckily hit no one. Before Phillip could go aboard the shaft of the spear had to be broken off. When the party reached Sydney Cove, the assistant surgeon (Balmain) extracted the spear-head, which had missed the vital organs, and in six weeks Phillip had completely recovered. He refused to punish Willemering, but Bennelong and Colebee gave the offender a sound beating. Bennelong and another black, named Yemmerawanyea, accompanied Phillip when he left Sydney in December 1792. Yemmerawanyea died in England, but Bennelong returned to Sydney.

Phillip's wish to conciliate the natives proved unattainable. Tench—who was in favour of friendliness—ascribed the failure to the aboriginal temperament:—'they either fear, or despise us too much, to be anxious for a closer connection . . . the fickle, jealous, wavering disposition of the people we have to deal with.' The belief that some misbehaviour of La Pérouse's French crews had provoked hostilities he dismisses as absurd. It is probable that the natives' distrust of the whites—which occasionally developed into active hostility—was caused, as in so many other new European colonies, by mutual ignorance of national customs. The aboriginal view of property, especially of property in food-supplies, was not understood by the colonists, who must have trespassed repeatedly on native food-preserves; on the other hand the natives looked on sheep and cattle as varieties of kangaroo, and saw no harm in taking their share. In the end Phillip was driven—probably much against his will—to send out punitive expeditions in order to stop the murder of isolated working-parties (see DAWES, WILLIAM); but at the same time he strictly forbade all 'persons not expressly ordered out for that purpose, ever to fire on any native, except in his own defence, or to molest him in any shape.'

Among other details of administrative organization Phillip divided the settlement into four sections, appointed a night-watch, set up courts of civil and criminal jurisdiction, and made regulations for the maintenance of public order—which brought him into conflict with Ross. Always he kept firmly before him the need of developing agriculture, so that James Ruse (q.v.) was given a small grant of land at Parramatta, on which he 'sowed the first graines.'

Having established farms at Parramatta, conferred grants of land on various officers and settlers, and introduced the system of assigning the services of prisoners to holders of agricultural land, Phillip desired to return to England; but when he pleaded ill-health his resignation was accepted. On 11 December 1792 he embarked in the *Atlantic*, and on arrival in England in 1793 was awarded a pension of £500 in recog-

nition of his services. He died at Bath on 31 August 1814, and was buried in the church of St. Nicholas at Bathampton.

Phillip's cool, determined courage saved the infant settlement at Sydney Cove from being blotted out by starvation. By developing agriculture he made the settlement self-supporting. As an administrator he transformed a naturally disorderly mob into a sober and well-disciplined community. As an explorer he opened up fertile areas that enabled the colony to raise its own food. Australia owes much to officers of the British navy; to Arthur Phillip, a naval officer of the best type, she owes her very existence as a British community. See NEW SOUTH WALES.

J.Sa.

Philosophical Societies. See SOCIETIES, LEARNED.

Philp, SIR ROBERT (1851-1922), was born in Glasgow on 28 December 1851, brought to Queensland when ten years old, and educated at the Normal school in Brisbane. In 1863 he began a commercial career, and after 11 years' service with Bright Brothers migrated to Townsville and joined James Burns (q.v.) managing the Townsville business from 1877 onwards and in 1883 becoming a partner in the well-known firm of Burns, Philp and Company. In 1886 he entered politics and thenceforward devoted most of his time to them. As a supporter of Sir T. McIlwraith and his policy of making the northern areas of Queensland into a new colony, Philp won the Musgrave seat in 1886 and one of the two Townsville seats in 1888; the latter he held continuously until 1915. In 1893 he joined the Nelson ministry as secretary for mines and public works, and remained a minister under Nelson, Byrnes, and Dickson until the end of March 1899, holding at various times the portfolios of mines, works, public instruction, and railways, and eventually becoming treasurer; this office he held from March 1898 to December 1899, making his name as a straightforward and clear-thinking —if decidedly conservative—administrator. In December 1899 the first Labour ministry of Queensland held office for seven days; then Philp came back as premier for nearly four years, led the opposition from September 1903 to November 1908, enjoyed a short premiership from that month till the following February, and returned to opposition until November; he then formed a coalition with his rival William Kidston and, declining a portfolio, supported him and his successor Digby Denham as a private member until his defeat at Townsville in 1915. He then retired from politics, returned to commercial pursuits, and died at Brisbane on 17 June 1922. He was warden of the council of the university of Queensland from 1916 until his death. (K.C.M.G., 1915.)

Phosphate. See MANURES and MINERALOGY.

Phyllanthus, a large and widespread genus of the family Euphorbiaceae, consisting of trees, shrubs, or herbs with insignificant unisexual flowers. Thirty-nine species, ranging from east to west over warm regions, are indigenous to Australia. *P. Ferdinandi* (White Beech, Pencil Cedar, the 'tow-war' of the Queensland aborigines) is a medium-sized tree, with bronze-green leaves that turn red in autumn. The compressed fruit-capsules (known to children as 'cheeses') are ruddy and ornamental. The timber is close-grained and of a soft gray colour, and easy to work; it is used for staves, but warps somewhat in drying. *P. Gastroemi* is an ornamental shrub with slender, pendulous branches, whose oval leaves (arranged in pairs) impart a mimosa-like appearance to the foliage.

Pigeon, Blue. See CUCKOO-SHRIKES AND CATERPILLAR-EATERS.

Pigeon, Cape. See PETRELS.

Pigeons, birds of the order Columbiformes, which is represented throughout the world but is most numerous in the Australian region. About 25 species of pigeon occur in Australia, including representatives of three families—Columbidae, Turturidae, and Treronidae.

The first-named family contains only two Australian species, the White-headed Pigeon or 'Baldy' (*Columba norfolciensis*), and the Pheasant-tailed or Brown Pigeon (*Macropygia phasianella*)—both of them confined to the scrubs of eastern Australia.

Of the 15 Australian species of Turturidae, all but one are peculiar to Australia, the exception being the Green-winged Pigeon (*Chalcophaps chrysochlora*), whose range includes eastern and northern Australia and the Moluccas.

Wonga Pigeon (*length* 15 *in.*).

The largest member of the family is the Wonga Pigeon (*Leucosarcia melanoleuca*), an inhabitant of the scrubs of eastern Australia from Cape York to Victoria. Perhaps the best-known of all the Australian pigeons is the Bronze-wing (*Phaps chalcoptera*), found in open forest country throughout the continent, and much sought after by sportsmen; the allied Brush Bronze-wing (*P. elegans*) inhabits the coastal scrubs of eastern Australia, and extends to Tasmania. This was the first Australian land-bird to be met with by Europeans. Pelsart (q.v.), describing the fauna of the Houtman Abrolhos group in 1629, mentions that in the two largest islands (now called the Wallaby Islands) in addition to 'large numbers of a species of cats, which are very strange creatures,' (the wallabies) 'we also found a number of grey turtle-doves.' As this pigeon is still plentiful and breeds on

the islands, and no other species occurs there, it seems certain that Pelsart refers to the brush bronze-wing.

Most of the remaining members of the family are inland birds and live principally on the ground, feeding on the seeds of grapes and desert shrubs. In the evenings and early mornings they visit waterholes in great numbers to drink, and many Australian explorers have been

Bronze-wing Pigeon (*length* 13½ *in.*).

indebted to them for a hint as to where water could be found. Forms confined to the interior are the Harlequin Pigeon or Flock-pigeon (*Histriophaps histrionica*), the Crested Bronze-wing (*Ocyphaps lophotes*), two species of partridge-pigeon (*Geophaps*), two plumed pigeons (*Lophophaps*), and two rock-pigeons (*Petrophassa*).

The small pigeons generally known as doves are also members of this family. There are three indigenous species, the Peaceful Dove or Ground-dove (*Geopelia placida*), found throughout eastern and northern Australia, the Diamond-dove (*G. cuneata*), and the Barred-shouldered or Mangrove-dove (*G. humeralis*), commonest in the north. Two species of turtle-dove have been introduced, and are now thoroughly acclimatized in the neighbourhood of the large cities. The Indian Turtle-dove (*Turtur suratensis*)—commonly called the Java Dove—is one of the most familiar birds in Melbourne, Sydney, Brisbane, and Perth; the Senegal Turtle-dove (*T. senegalensis*) is common about the last-mentioned city.

Fruit-pigeons (Treronidae) are specially characteristic of the forests and jungles of southern Asia and the Malay Archipelago, but eight species occur in the coastal scrubs of northern and eastern Australia. Most are birds of brilliant plumage, vying with parrots in splendour. The best-known is the Nutmeg or Torres Straits Pigeon (*Myristicivora spilorrhoa*) which annually reaches northern Queensland in enormous numbers, breeding principally on islands off the coast and flying daily in great flocks to the mainland to feed in the scrubs. Its white plumage, relieved only by some black in the wings and tail, and its habit of flying low over the water, give it a great resemblance to a sea-bird. Another interesting Australian fruit-pigeon is the Top-knot Pigeon (*Lopholaimus antarcticus*), which derives its name from a curious double crest on the head. It occurs all along the east coast, and was first met with on the Endeavour River during Captain Cook's first voyage, when a number were shot for food.

W.B.A.

Pigfish. See WRASSES.

Pigs. The pig succeeds admirably in Australia and, with the exception of a few rare local outbreaks of preventable sickness, is remarkably healthy. He has made himself perfectly at home in the continent, running wild in many areas, such as the Macquarie marshes and the 'watercourses' in the north-west of New South Wales, the interior of northern Queensland, and the northern portion of the Northern Territory. In some places his appearance has reverted to that of his ancient progenitors, but for the most part the improved type has been preserved to a remarkable degree, especially in the Northern Territory, where food is abundant and easy to obtain. The wild pig's choicest delicacy is the root of the water-lilies which abound in the lagoons and billabongs. Although extremely wild when at large, when brought in he fattens well for market purposes.

Pigs were introduced into Australia along with the first white settlers. On 1 May 1788 there were 49 hogs and 25 pigs in the settlement, but by 1791 only 47 were left. In order to save expense in breeding stock, most of the government pigs were distributed to farmers. The production of swine's flesh in the early days was a matter of considerable importance, as fresh beef and mutton were practically unprocurable. In 1800 the swine numbered 2390; in 1817 they had increased to 17,842, and next year to 24,822. In 1826 James Atkinson, in his *State of Agriculture and Grazing in New South Wales*, discoursed much upon pigs:—'In seasons when the maize crop is abundant a great quantity of fine pork is fattened upon that grain, which is given to them whole; in the higher districts peas are much used, also potatoes, rye and barley which are given in a raw state . . . Pork fluctuates much in price but usually fetches from 6d. to 9d. per pound.' In 1821 there were nearly 34,000 pigs in the colony, 66,000 in 1842, 121,000 in 1851; but the unsteadiness of the rise since then is remarkable, not corresponding in any way to rainfall records or the other phenomena that affect live stock. Thus 1872, 1880, 1890, and 1904 were good pig years followed by falls, whereas for cattle, sheep, and horses they were moderate years followed by rises. In 1904, 1911, and 1917 Australia owned over a million pigs—in 1917 was attained the maximum number, 1,169,365. In proportion to population the number of pigs has of recent years much diminished; in 1880 there were four pigs to every 11 inhabitants, in 1923 only four to every 25.

Breeds.—For many years pig-breeding was carried on with the utmost carelessness. In 1870 the official report of the intercolonial exhibition, in its section dealing with pigs, lamented that 'Nothing very definite can be stated as to the particular breeds. A few gentlemen have

Drawn by Neville W. Cayley.

Top-knot Pigeon
(*Lopholaimus antarcticus*).

White-headed Pigeon
(*Columba norfolciensis*).

Nutmeg Pigeon
(*Myristicivora spilorrhoa*).

kept special breeds in stock, and with regard to the produce of their own farms have maintained a pure race, or crossed them for particular reasons. But, as a rule, the farmers pay no attention whatever to the breed of pigs, nor has any systematic attempt been made to determine whether particular kinds are specially adapted to different parts of the Colony.' At that exhibition prizes were offered not for any particular breed of pig, but for large breeds, small breeds, long-bodied pig, for boar of any age, sow of any age, sow and litter, and fat pig. A breed greatly in favour then and earlier was the Old China, traces of which may still occasionally be found; the American Poland-China also came into prominence at that time. Since then, however, great care has been bestowed on improving the breeds of pig, as well as the methods of curing bacon.

The principal breeds suitable to Australian conditions are:—the *Berkshire*, which is the favourite, thrives everywhere, and is unaffected by extremes of climate; the *Large, Middle*, and *Small Yorkshire*, all quick-growing and early-maturing breeds, good bacon-pigs, producing lean meat; the *Tamworth*, specially valuable for crossing with fat breeds; the *Large Black*, a bacon-pig, giving well-streaked bacon of firm texture; the *Poland-China* (an American breed), having fat carcases and fattening quickly, and consequently of special value for pork-production. The best crosses are the Berkshire and Middle York cross—a special favourite in Queensland, where it can be fattened up for sale in seven months—and the Tamworth and Poland-China cross. Classifying the breeds according to colour, the best modern breeds are: —*Black*: Berkshire, Large Black, and Poland-China. *White*: Large and Middle Yorkshire. *Red*: Tamworth.

Statistics:—

	Number of Pigs, 1924-5.	Bacon and Ham. lb.
New South Wales	339,669	21,115,901
Victoria	288,509	21,993,869
Queensland	156,163	15,640,561
South Australia	80,988	5,374,457
Western Australia	66,375	2,797,151
Tasmania	47,305	2,428,966
Northern Territory ...	609	—
Federal Capital...	—	—
Total	979,618	69,350,905

The value of exported pig-products in 1924-5 was:—Bacon and ham, £124,891; lard and refined fats, £42,744.

W.S.C.

Piguenit, CHARLES WILLIAM (1836-1914), born at Hobart on 27 August 1836, in 1849 entered the Tasmanian survey service and in the course of his duties made several arduous journeys in the western highlands of the colony, often sketching the wild scenery through which he travelled. In 1872 he retired from the service, and began to revisit his old haunts in order to paint them. In 1874 he thus traversed the Huon and Gordon valleys, in 1876-80 the south-eastern and eastern districts; in 1876 his picture of Mount Ida above Lake St. Clair was bought by James Agnew (q.v.), and thenceforward his skill as a painter was generally recognized. In 1880 he settled in Sydney and helped to found the Art Society of New South Wales (see ART). In 1887-8 he revisited Tasmania and made pictures of Derwent valley and West Coast scenery which attracted much attention, so that the colonial government put a vote on the estimates to purchase eight of his monochrome paintings for the Hobart gallery. In 1901 he was awarded the Wynne prize at Sydney (see ART GALLERIES), and in 1903 was commissioned by the trustees of the Sydney gallery to paint Mount Kosciusko. During a visit to England in 1898 he painted several landscapes which were bought and engraved by Henry Graves and Company, then the principal engravers in London; during a second visit in 1900 he did a good deal of work in North Wales, and exhibited at the Old Salon in Paris. Probably his best work is 'The Valley of the Upper Murray,' which hangs in the Australian Club at Sydney. He died at Hunter's Hill near Sydney on 17 July 1914.

Pilbarite. See MINERALOGY.

Pilchard. The Australian pilchard (*Sardinia neopilchardus*) is scarcely distinct from the pilchard of Europe. It occurs periodically in vast shoals on the coasts of south-eastern Australia and Tasmania, and provides an abundant food-supply for large fishes which pursue the shoals as they migrate northward. Otherwise little definite information is available about their habits and migrations. They have occasionally appeared in such numbers as to be procurable by the ton by simply dipping them out of the sea with buckets. They range northwards into the waters of southern Queensland, and round the southern coast of Western Australia. No organized effort has been made to capture and market the Australian pilchard. The young of the European species (known as sardines) are tinned, and huge supplies are imported into Australia each year, but the locally-procurable sardine is entirely neglected.

Pilot-bird, a bird (*Pycnoptilus floccosus*) about six inches long, the sole member of its genus, confined to south-eastern Australia. Its classification is quite uncertain; it has usually been placed among the Timaliidae, and is probably related (as suggested by G. M. Mathews) to ground-wrens, field-wrens, and scrub-wrens.

The pilot-bird lives in secluded gullies, where it passes most of its time on the ground, hopping

Pilot-bird (*length 6½ in.*).

about among tangled vegetation in search of insects and seeds. One of its clear calls, which can be heard for a considerable distance, resembles the words 'guinea-a-week'—a name by which it is sometimes known. The name 'pilot-bird' was bestowed on it because it frequently accompanies the lyre-bird to pick up scraps unearthed by the latter, just as the pilot-fish attends on sharks.

The pilot-bird is dark chocolate-brown above, rufous on the breast, and white beneath, with a patch of chestnut below the tail. It builds a dome-shaped nest of grass and leaves, with the entrance at the side, among thick undergrowth near the ground. The two eggs are purplish-brown, with some blackish marks on the larger end.

W.B.A.

Pilot-fish, an oceanic species (*Naucrates ductor*) that roams the seas of the world throughout temperate and tropical regions. It commonly associates with sharks, and popular belief credits it with the habit of piloting them into safety when danger threatens—it is even supposed to render the same service to ships. Its association with both sharks and ships, however, is due to the supply of food-scraps available from their leavings. The pilot-fish is strikingly marked with broad, blackish cross-bars upon a whitish ground-colour; its torpedo-shaped body is admirably adapted for speed, offering but little resistance to the water, and so enabling it both to keep pace with, and to avoid the attacks of, its giant associates. It grows to a length of about two feet. See SUCKING-FISH.

A.R.McC.

Pimelea. See THYMELACEAE.

Pimpernel, English. See NOXIOUS PLANTS.

Pinchgut, a small rocky island in Port Jackson named by the aborigines Mattewaya and officially known since 1856 as Fort Denison, was when the first settlers arrived a gray, weather-beaten rock rising perpendicularly in a slender column 75 feet above the water. Phillip called it Rock Island and found it a convenient place on which to maroon refractory convicts; from their sufferings when thus exposed on a bread-and-water diet in full view of all the Port Jackson shipping the island got its more usual and colloquial name. Hunter occasionally used it for hanging a criminal 'in chains;' but the spectacle scared the natives and did not in any way terrify the other convicts, so the practice was abandoned. In 1839 Major Barney (see MILITARY DEFENCE) recommended that the island should be used as the site of a battery for harbour defence, and in 1840 cut it down almost to water-level for that purpose, but the British authorities refused to let him do more. In 1855 Sir William Denison, just made governor of New South Wales, revived the Barney defence-scheme (though it was long out of date) and constructed on Pinchgut the central fort, which he named Fort Denison; as soon, however, as his influence was removed, the inner harbour forts were abandoned and attention was concentrated on those nearer the harbour mouth. Fort Denison, therefore, with its antiquated martello tower, was never in active use, and became merely a storehouse for discarded cannon and ammunition. When the Commonwealth took over defence the stores were gradually removed and the island handed back to New South Wales. It is now maintained as a place of pseudo-historical interest, and used for harbour signals and for the display of fireworks on gala nights; proposals have been made to place on it a gigantic statue after the pattern of the statue of Liberty in New York harbour.

Pineapples. See FRUIT-GROWING.

Pines. This name is popularly given to a number of different trees belonging to the families Pinaceae and Taxaceae. *Pinus* (the true pine) is not represented in Australian indigenous flora. Of the Pinaceae the genus *Agathis* extends to Malaysia and New Zealand; two species are endemic in Queensland. *A. robusta* (Queensland Kauri) is a coastal tree 80-130 feet high, with a timber very like that of the Kauri pine of New Zealand (*A. australis*). *Araucaria* represents a form of vegetation, distinguished by simplicity of structure, now extinct in many parts of the world; it is most abundant in New Caledonia,

Araucaria Bidwilli

and extends to Papua and South America; one species inhabits Norfolk Island and two are indigenous to Australia. *A. Bidwilli* (the Bunya-bunya of Queensland) is often cultivated as an ornamental tree in the other States. The large seeds are sweet before they are ripe, but when fully matured taste like roasted chestnuts. Once in three years they are very plentiful, and the aborigines used to assemble from long distances to feast upon them. Each tribe had its own particular set of trees, of which a certain number were allotted to each family and handed down from generation to generation; the bunya, indeed, was the only hereditary property the aborigines were known to possess, and was therefore protected by law. The food is roasted and eaten in large quantities, and appears to have a fattening effect. Contrary to their usual habit, the aborigines sometimes stored the nuts, hiding them in a waterhole for a month or two. The tree has a useful timber, and exudes a pure, clear resin. *A. Cunninghami* (Hoop, Moreton Bay, or Richmond River Pine) ranges from northern New South Wales into Queensland. It

yields a valuable timber (of which the mountain-grown is preferable to the coastal) and exudes an almost colourless resin, which sometimes hangs in amber-coloured pendants 3 feet long and 6-12 inches wide, smelling like Canada balsam. *A. excelsa* (Norfolk Island Pine) is naturally limited to that island, but has been widely planted throughout southern Australia; it is especially suitable for exposed sea-coast stations. *Arthrotaxis* is limited to Tasmania, where three species (small to medium-sized trees) grow in the western mountain district. *A. cupressoides* is the original King William (or King Billy) Pine, named in honour of William IV. *Callitris*, among whose species are the black (or red) pine, the white (or common) pine, and the Middle Harbour pine, is treated separately.

Of the Taxaceae five genera are indigenous to Australia. *Dachrydium* has one indigenous species, *D. Franklini*, the famous Huon Pine of Tasmania, named in honour of Sir John Franklin. Owing to the durability of its timber (which is specially adapted for boat-building), it has been greatly in demand, and is now becoming scarce, the species being limited to Tasmania. The genus *Phyllocladus* (in which phyllodes take the place of true leaves) extends to Malaysia and New Zealand; one species only, *P. rhomboidalis* (Celery-top Pine), is endemic in Tasmania. It is a stately tree of 50-60 feet, with a timber much in request for ships' masts and spars. *Podocarpus*, extending to South America and eastern Asia, comprises 6 indigenous species, which have edible fruits known as 'damsons,' consisting of the fleshy fruit-stalk expanding into a receptacle upon which the seed is seated. *P. elata* (She-pine or Brown Pine) is a large tree, ranging from New South Wales into Queensland, with a tough interlocked timber, fine in the grain and not readily attacked by white ants. *P. spinulosa*, endemic in New South Wales, is a spreading bush with prickly-pointed leaves; the fruits, mixed with those of the native currant, are made into puddings. *P. Ladei* (Mount Sturgeon Pine) is a large tree, found in Queensland. *P. alpina* is a straggling undershrub, found at high elevations in Tasmania and on the Australian Alps. The only species found in Western Australia is *P. Drouyiana*, which in the south-west is considered an indication of poor land, and is known locally as 'emu-berry.'

Pipe-fishes. See SEA-HORSES.

Piper, JOHN (1773-1851), born at Maybole, Ayrshire, in Scotland, entered the army on 20 April 1791 as an ensign in the New South Wales Corps (lieutenant, 1795; captain, 1800; captaincy confirmed by war office, 1806). Arriving in Sydney on 14 February 1792, in the vessel that brought out Grose, he was in 1793 sent on duty to Norfolk Island, but in 1797 went home on leave and, when he returned in 1799, was kept at headquarters and allotted grants of land. When Paterson in September 1801 challenged John Macarthur (q.v.) to a duel, Piper acted as Macarthur's second, and was put under arrest by King; a subsequent court martial, however, acquitted him of any breach of discipline, and in 1804 (after two years' service at Parramatta) he was again sent to Norfolk Island, of which he was commandant from 1805 to 1810, 'with great credit to himself'—to quote Macquarie—'and the satisfaction of the Governors-in-chief of this Territory.' He also gained Macquarie's favour by his wise and just advice with reference to claims arising out of the removal of Norfolk Island settlers to Tasmania.

Leaving Sydney on 19 October 1811, he took Macquarie's despatches to England and was for about a year placed in charge of the 100th regiment, then stationed at Winchester. But he was anxious to return to Australia, and early in 1813 retired from the army and secured from Bathurst the appointment of 'naval officer'—i.e. harbour-master and collector of customs—at Sydney. There he settled down, living at first on the western side of Sydney Cove, and using Vaucluse House as a week-end cottage. He then moved to Burwood, and finally built himself a fine house on Point Piper, then known as 'Eliza,' 'Elizabeth,' or 'Elizabeth Henrietta' Point. His hobby was horse-breeding and racing, and until 1821 he was a steward of the Sydney Jockey Club. Through Macquarie's and Brisbane's terms he held his office undisturbed, efficient on the whole, and extremely popular, but (as might be expected from such a 'good fellow') inclined to laxity in the collection of moneys due to the government. Consequently, when Darling arrived in 1826, full of zeal and contempt for Brisbane's leniency, he almost at once fell foul of Piper both in his capacity of naval officer and in that of president of the bank of New South Wales. Enquiries showed that the bank had granted its friends 'great and improvident accommodation,' and that the naval office (partly because Piper's staff was quite inadequate to its multifarious duties) had failed to collect a good deal of revenue. In 1827, therefore, Piper resigned his presidency and was retired from the position of naval officer—which was abolished in favour of a regular customs establishment. To pay off arrears due to the government he was compelled to sell all his Sydney properties (including Vaucluse House) as well as his suburban and country farms. He retained, however, a large estate near Bathurst, called Alloway Bank, and settled there for the rest of his life, entertaining Darling there in 1829—a clear proof that the mistakes he had made in Sydney were not regarded as affecting his personal honour. At Bathurst he was visited by old friends high in public life, whose confidant and adviser he was; and there he died on 30 June 1851.

His popularity, especially among sea-going men, is shown by the repeated occurrence of his name on the map; it is borne by a river in Tasmania, a cape and some islands in the Northern Territory, and several localities near Sydney.

Piperaceae, a family of herbs, shrubs or climbers widely distributed in temperate, but chiefly in or near tropical, regions. Two genera are indigenous to Australia; *Piper*, one of them, has seven indigenous species. The flowers are small, in terminal spikes. *P. Novae-hollandiae* (Climbing or Native Pepper) creeps like ivy up the trunks of the tallest trees. It affords a stimulus to the mucous membrane; its active principle is a brownish oily fluid, with a pleasant aromatic taste and a benumbing effect on the tongue, even in small quantities. The wood is coarse-grained, and pungently-scented when newly cut. *P. hederaceum*, also a climber, is a good honey-yielding plant. The genus *Piperomia*, of which five species are known, consists of small, inconspicuous herbs.

'Pipes,' the name given to certain scurrilous papers which were circulated in the earlier days of the colony of New South Wales, lampooning high-placed officials or other well-known persons. The word is a slang term, and is the noun of the verb 'to pipe,' that is, to watch a man and in

some way victimize him. The first 'pipes' were circulated in 1803 against Governor King, whose efforts to prevent the sale of rum (see RUM, TRAFFIC IN) met with much hostility. The authors at first contented themselves with making 'most seditious drawings . . . in the barrack yard.' The next day an 'anonymous seditious paper made its appearance, said to have been found in the yard of Capt'n Kemp's barrack.' Two days later a 'paper of the same kind was found near an officer's barrack,' and after another three days 'another paper of a still more seditious nature was found, as said, in a chaise belonging to Lieut. Hobby, of the New South Wales Corps, who...took it to Parramatta, where he read it and published it to different persons.' A copy was obtained by Ensign Bayley from Major Johnston, 'which he also did his utmost to disseminate.' King immediately ordered the officers to be tried by court martial. As the court consisted of brother officers, the charges were dismissed, leaving the governor to complain bitterly to Lord Hobart that 'a Governor has very little chance of justice where he is so situated, having only one Corps, and but a sufficiency of officers to sit [as] a Court-Martial, and being unable to manage the prosecution in person.' The excerpts given below show the nature of the 'pipes' in question. The first was sent to Captain Abbott 'and the rest of the officers' after the recovery of the governor from a serious illness, and purports to be a conversation between eight officials; two verses put into the mouths of John Harris and Samuel Marsden are here quoted:—

H-r-s.

To every loyal Christian feeling heart
The earnest news I hastily impart;
Congratulate you all, Te Deum sing!
Escaped from death and gibbet is our K——g!

. . . . .

M-rs-n.

He now resumes his old indignant sway,
And gives this notice: That on every day,
Sundays excepted, will be exposed to vend
All public stores that Government may send,
As well as those in hand;—'twill make him rich,
And save the howling pains of dying in a ditch.

'Keep shop' in the second verse of the following refers to the fact that on Mondays Governor King used to superintend the exchange of government stores for the settlers' grain.

Extempore Allegro

My power to make great
O'er the laws and the State,
  Commander-in-Chief I'll assume;
Local rank, I persist,
Is in my own gift [fist],
  To doubt it who dare shall presume?

On Monday keep shop,
In two hours time stop,
  To relax from such kingly fatigue,
To pillage the store
And rob Government more
  Than a host of good thieves—by intrigue.

For infamous acts from my birth I'd an itch,
  My fate I foretold but too sure;
  Tho' a rope I deserved, which is justly my due,
I shall actually die in a ditch—
                And be dammed!

The lampoon circulated by Lieutenant Thomas Hobby contained the following:—

——————— Pitt and Portland are out,
Then says K—g, "I soon shall be put to the rout;
But damn me, while powerful, I'll do what I can,
According to what I proposed as a plan,
To make all subservient, humble, and poor,
Take women and children all off from the store,
Crush all independence and poverty plant,
Ruin, tense, and distress, and make every one want.
If my power was not stinted, I'd make the world shake,
Give serjeants commissions and officers break,
Which already I've tried, but in vain showed my spite,
And bit my own tongue when nought else I could bite.
I'd civilians give trust, confide in new faces,
Make magistrates of them and give them new places.
No servant of mine shall know what remorse is,
And my cook takes her pleasure on Government horses.
The convicts I'd starve, and sell all their rations,
As well as their slops, for my private occasions.
The salaries of superintendents are mine,
If e'er they neglect to secure them in time.
From the orphan collection I take what I dare,
Of whalers' investments I own I've a share.
Tythes, taxes, and quit-rents unto me belong,
And duties on spirits I claim as my own.
Such pickings are surely beyond all resistance,
And such as I covet for future subsistence."

It ended with the words:—

Blush! grandeur, blush! Proud courts, withdraw your blaze!
Ye little stars, hide your diminished rays.

In September 1817 Lieutenant-colonel Molle libelled D'Arcy Wentworth in a letter to Macquarie complaining that Wentworth had 'grossly insulted and threatened' him. Wentworth was in consequence placed under close arrest on 9 September. Soon after, there was found in the barrack-yard a scurrilous lampoon which was attributed to him, but was afterwards admitted to be from the pen of his son. No copy of the lampoon is to be found, but the following dialogue between Cacomanus (Alexander Riley) and Janufacies (Molle) gives a fair notion of the original 'pipe.'

Cacomanus Loquitur

Dear Janu, I hear that the rascally Pipe,
Which, alas, gave YOUR Honour so dreadful a wipe,
Has created such Laughter all over the town
That a Death Blow is given to all your renown,
And instead of believing that wonderful Story
You tell us so often o'erwhelmed you with Glory,
The people—such rascals, Oh may they be damned!—
Refuse any longer by us to be crammed,
And believe that your *Laurels* all turn out at last
To be stolen from the Brow of the brave *Pendregrast.*
And many of those whose favor we've Courted
Swear that Justice must sleep, since you're not here transported.
And the wretches so prone are to ridicule after
That your Medal from Egypt excites them to Laughter,
And they say, when you talk of the Pyramid *Pile,*
That the fact is well Known, you ne'er crossed the *Nile*;
And I know not, indeed, how this point you'll recover.
But they swear, you came when the fighting was over,
And that, e'en if you swore it until you were tired,
You never in Action saw a *Shot fired,*
And, more, that your Medal should from you be torn,
As you know it is ordered they no more are worn.
For that Wellington's Heroes alone have obtained
Distinctions that *Valor* and Bloodshed have gained,
While those gained like yours, 'stead of hon'ring the bearer,
Reflect everlasting disgrace on the Wearer.
Say, what shall we do, how recover your fame?
Or shall we despise it? 'tis but a name—

Janufacies Respondet

Oh! this terrible Pipe! What a downfall is here,
That all is detected, alas, is quite *clear.*
Farewell to all boastings of Storm and of *Breach*;
The *Drill* and the Review are now all I can reach,
And in future, Dear Caco, I fear 'tis my Doom
To confine all my stormings to *Subs'* barrack-room,

Where with power supreme, I can storm without *measure*
And writing Desk Locks can break open at pleasure.
How cruel my fate! All my searches in Vain;
The wicked *Pipe Maker* despises my Pain,
While, secure in his Covert, he laughs at my trouble,
At the loss of my fame, which you think but a *bubble*.
But, Dear Cacomanus, how dreadful the thrust
The Vile Pipe Maker gave when the Bubble he burst
And all my Vain glories. Seringapatam
All gone to the *Devil*, not valued *one damn*.

The rest of the dialogue is in the same vein. Macquarie is referred to as 'Sandy,' D'Arcy Wentworth as 'Medicus,' Molle is 'Janufacies' (i.e. Double-faced).

Wentworth also lampooned his father without compunction, as the following pipes show:—

On hearing that a ci-devant Quack Doctor was actively employed in circulating the Bank Bills of a Certain Magistrate, who had formerly rendered the Doctor the same Service in distributing his Hand Bills:—

Par nobile Fratrum
"Hail, gratitude! blest attribute of Heaven."
Milton

In days of Yore, the Count was used to stop
Each passing stranger, and of Daffy's shop
Into his hand would slip a puffing Bill,
Swearing besides the virtue of the Pill.
So Daffy's turn 'tis now, to set afloat
His old acquaintance's new One pound Note.
Peter Paste Pot.

Impromptu

On seeing a person officiating as a Magistrate, who was recognised by the Author as having formerly been engaged, in his Capacity of Bill Sticker, in placarding the puffing Bills of the celebrated Dr. Leake.

Non sic olim
Remember thee, alas, poor Ghost! *Hamlet*

Divinity, Law, and Physic—as they say—
Stand in Mutual relation of Brother.
It is thus that the Count then distributes one day
His Physic, his Law on Another. Quiz.

Hint to a certain Magistrate, who terribly threatened the Pipe Maker:—

Tantacne animis caelestibus irae?
Dread Sir: how cruel in such Doggerel Rymes,
T' expose to Vulgar Eye the good old times,
When you, Industrious Man, by Labour hard
And Paste, and Hand Bill, gained but poor reward.
Take my advice, the *piper* to Appal,
Whene'er you meet him, stick him against the *wall*.
Dick Dab.

On hearing that a certain Magistrate devoured a prodigious Quantity of Plum pudding, at a late dinner at Government House:—

Propositi tenax
A certain great Count, at a dinner of late
Ate of pudding, they say, at least a pound weight.
No wonder; for can we forget it in haste,
How much of his Life he had Dabbled in Paste?
Ben Brush

Another curious pipe, which was plastered on posts of the town, reads:—

Doctor Halloran is a coward, he having by letter insulted and challenged a young man to meet him which was excepted (*sic*) but the Doctor's boasted courage failed him

July 30 1824
For further particulars Enquire Wics clap match and pup Fir Seal skins

A carelessly printed brochure entitled *To Bourke's Statue* was circulated in the fifties. It declared itself to be 'an appropriate effusion . . . . unceremoniously dedicated by Ichneumon, anxious to instruct his Grandmothers in the inductive science of sucking eggs,' comprised 31 pages, and lampooned most of the leaders of the day. It was found out afterwards that it was the work of T. L. Mitchell, jun.

Sir T. L. Mitchell (the poet's father), finding a copy of the pamphlet on his desk, read it with great gusto until he came upon:—

See him of aspect dire and haughty gait,
As though himself were a triumvirate,
Who dreams of honors, forges Bomerang screws
And wakes in anger Camoen's lofty muse;
Who damns the language that cooked such rhyme
(To spoil the Lusiad were a heinous crime:)
Your childish choler but provokes a sneer,
And makes you small, the very smallest beer.
With Sisyphic attempts Fame's temple try,
No niche is there for eccentricity—
High *roads Colossus*, once was yours the power
To move each bullock team as coach and four.
Why did you fail, when yours the ironed man
To make the 'high hills hop' as hop'd 'Bashan?'
Go grave your maps, in survey you succeed;
Where praise is worthy, let me grant the meed,
Thousands of men and money shout for land,
But here as elsewhere work is at a stand.—

It will be seen from these specimens that 'pipes' had but small claim to literary merit. The verses are mostly doggerel, although it is probable that their authors sometimes thought otherwise. Latin was almost an essential of the education of the time, and the writers are fond of airing their little schoolboy tags of that language. It was also the day of punning, and care was taken that a pun should not be overlooked for want of underlining or italics. If, for instance, we meet with '*Highroads Colossus*,' we are to think of the Colossus of Rhodes. The spelling is not always of the best, and a challenge may be 'excepted;' the punctuation, whether of the manuscript copies (now in the Mitchell Library at Sydney) or of such sheets as got into print, is generally hopeless, and it is tolerably clear that the hands which copied the 'pipes' were not those which first wrote them —a sufficiently comprehensible precaution.

J. V. C.-B.

Piping Crow. See MAGPIES.

Pipits. See LARKS AND PIPITS.

Pipturus, a small genus of the family Urticaceae, dispersed over Malaysia. *P. argenteus* (Native Mulberry or Queensland Grass-cloth Plant), is a tree which may reach a height of 50 feet. It is the 'coomeroo-coomeroo' of the aborigines, who use the white berries as a food. The inner bark affords a fibre of fine texture and great strength, but is rather difficult to prepare. It grows in the brush forests of New South Wales and Queensland.

Pitcairn Island. See BOUNTY, MUTINY OF THE.

Pitcher-plant, a name popularly applied to species of *Nepenthes*, a large genus of the family Nepenthaceae, widely spread over tropical Asia and Malaysia, and especially abundant in northern Borneo. The few species endemic in Australia are practically confined to the Cape York Peninsula; they are shrubs or undershrubs with herb-like branches full of spiral vessels. The stems are diffuse, or climbing by means of tendrils on the ends of the leaves; base of the leaf-stalk winged and stem-clasping; the midrib produced either into a tendril or a pendulous pitcher provided with a lid, the margin of whose orifice is thickened and usually has an external spur; flowers small, green, in clusters.

The Western Australian Pitcher-plant is *Cephalotus follicularis*, belonging to the family Saxifragaceae; it bears ordinary as well as

pitcher-shaped leaves, the latter being formed by a pouching from the upper surface of the ordinary leaves. Glands on the interior of the

Western Australian Pitcher-plant.

pouch secrete—as do those of the *Nepenthes* species—a sweet fluid with digestive properties.

Pittas, small and brilliantly coloured terrestrial birds, with short tails and long legs, belonging to the family Pittidae. They are most abundant in the Malay Archipelago, but extend north to China and west to West Africa. 'Pitta' is the Telugu name for one of the species. Three species occur in Australia; two are confined to

Noisy Pitta (*length* 8½ *in.*).

the north of the continent, the third, the Noisy Pitta or Dragoon-bird (*Pitta versicolor*), extends south along the east coast to northern New South Wales. This species has a black head, deep-green back, black tail and wing-quills, and buff-coloured breast; there are patches of brilliant metallic blue on the shoulders, of bright scarlet under the tail, and of white on the wings. It frequents the densest parts of the scrubs, feeding on insects, snails and fruits, and would rarely be seen if it did not draw attention to itself by a loud call (resembling the words 'walk to work') which it constantly repeats.

W.B.A.

Pittosporaceae, a family of trees, shrubs, or climbing plants. Eight genera, containing 50 species, are indigenous to Australia. The flowers are of various colours; fruit a capsule. *Hymenosporum,* with one species (*H. flavum*) extending from northern New South Wales into Queensland, is a highly ornamental slender tree with showy yellow flowers, often to be seen in gardens. *Bursaria spinosa* (Blackthorn) is a spiny shrub (or small tree) with sprays of small white flowers, extending throughout the Commonwealth. It has a white wood. Sheep are fond of the leaves, but, owing to the strong thorns, can only nibble the ends of the branches. It is unfortunately very liable to attack by a waxy scale (*Coccus*), and hence is one of the very few native plants proclaimed a pest at the instigation of fruit-growers. *Marianthus* has 14 species, chiefly found in the western areas, mostly prostrate or twining undershrubs with blue, white, or reddish flowers. *Citriobatus* has two species confined to eastern Australia—rigid, much-branched shrubs armed with thorns. *C. pauciflorus* (Orange-thorn) has an edible, orange-coloured berry well known to the aborigines; it has been suggested as a hedge-plant, but, like so many of the Pittosporaceae, is a prey of insect-pests. *Billardiera* is a largely western endemic genus of 8 species, mostly climbers with showy flowers; *B. scandens* (which ranges from South Australia to Queensland) has an elongated fruit called by children 'dumplings,' acid and not unpleasant when ripe. *Sollya,* with 2 species, is exclusively western. *S. heterophylla,* a commonly cultivated twiner, has nodding clusters of bright blue flowers. *Cheiranthera* is endemic, largely western. *C. linearis,* a low twiggy shrub often seen in gardens, has pretty blue flowers and extends from Western Australia to Queensland. See PITTOSPORUM.

Pittosporum, a large genus of the family Pittosporaceae, consisting of trees or shrubs dispersed over the warmer regions of Africa, Asia, Malaysia, and New Zealand; the species indigenous to Australia are mostly endemic. The leaves are usually entire; flowers more or less tubular; seeds embedded in a viscous or resinous substance. *P. undulatum,* indigenous to eastern Australia, is largely grown as an ornamental tree, whose unisexual flowers (the sexes borne on different trees) are heralds of spring in New South Wales. It has been suggested that the oil obtained from these might make a suitable basis for a perfume, the tree yielding a gum resin with a powerful odour of turpentine. The bark contains medicinal properties, and yields a fair percentage of both tannic and gallic acids; the timber is sought after by wood-turners. The tree, when introduced into the Azores as a wind-break for the orange-groves, was found to withstand the strongest gales. *P. phillyraeoides,* the Narrow-leaved *Pittosporum* or Butter-bush, is a small, graceful tree with willowy leaves, pendulous branches, and yellow flowers. The compressed capsules open out flat in two valves, exposing a bright yellow interior, to which the ruby-coloured seeds adhere by the aid of a gummy resin. The tree, which has a light, hard wood,

flourishes inland across the breadth of the continent, but is in some danger of extermination by grazing stock (see FODDER-PLANTS). The bitter seeds are used as food by the aborigines.

P. phillyraeoides.

P. bicolor (White-wood of Tasmania) was used by the aborigines for making clubs, and is now used for axe-handles, billiard-cues, etc.

Pituri. See ABORIGINES and DUBOISIA.

Plagianthus, a genus of the family Malvaceae, consisting of shrubs with undivided leaves and clusters of small white flowers; its ten species are confined to Australia and New Zealand. *P. sidoides* (exclusively Tasmanian, and known as the Tasmanian Kurrajong) is a quick-growing shrub that produces strong fibre. *P. pulchellus* (Hemp-bush), found in Victoria, Tasmania and New South Wales, yields a soft glossy fibre which would make good yarn.

Plain Currant. See TILIACEAE.

Plain-wanderer, a terrestrial bird (*Pedionomus torquatus*) about six inches in length, peculiar to south-eastern Australia; one of the most anomalous of Australian birds. Superficially it shows considerable resemblance to some of the small African bustards; its eggs, which are four in number and pear-shaped, closely resemble those of certain waders; but study of its internal anatomy by Dr. H. Gadow confirms the view, already adopted by Gould, that it is most nearly related to the button-quails, and it is now given family rank as the sole member of the Pedionomidae, and placed in the order Turniciformes.

The plain-wanderer is an inhabitant of open country and is solitary in habits, associating in pairs in the breeding-season, but not forming flocks like its relatives the quail. When disturbed, it usually runs rapidly like a rail, and is not easily flushed. Its flight is comparatively weak. Its coloration is mottled brown, with a black, white-spotted collar round the neck and a chest-

Plain-wanderer (*length 6 in.*).

nut patch on the breast. It stands upright, so as to peer over the top of the herbage. Its food consists of insects and seeds. Unfortunately, like most Australian terrestrial birds, it is rapidly becoming a rarity, being unable to stand the combined attacks of the man with a gun and the introduced fox and cat. W.B.A.

Planarians. See FLAT-WORMS and LAND PLANARIANS.

Planipennia, an order of insects including lacewings and ant-lions. It is well represented in Australia, about 250 species having so far been described. It is characterized by the wing-venation of the imago, in which the veins are typically split up into small branchlets along the wing-margin, and the dominance of the radial sector is generally very pronounced, a large number of parallel branches of this sector being present and occupying a large central area of the wing. The mandibles and maxillae of the larva fit together, and act as a pair of sucking-tubes. The pupa is always enclosed in a cocoon—which is unique in being spun from the larva's anus, instead of from its mouth, as in other cases.

More families are represented in Australia than in any other region of the world. Of special interest are the archaic Ithonidae, heavy-bodied moth-like insects, whose larvae burrow in sandy soil, and much resemble those of the scarabaeid beetles on which they prey. Another family not found outside Australia is the Nymphidae, which are closely related to the ancestors of the Myrmeleontidae. The well-known *Nymphes myrmeleonides* is still not uncommon at times; it is a very graceful orange-brown insect, with a strong musk-like odour.

The lovely silky lacewings (Psychopsidae) have their headquarters in Australia, 12 species being known there. One of the most beautiful is *Psychopsis elegans,* shown on plate xix, fig. 24. The larva is an extraordinary creature with big jaws, which hides in the crevices of the bark

of forest trees. The finest species in this family is *Megapsychops illidgei.*

The Sisyridae (spongilla-flies) are a very archaic family of small lacewings, whose larvae feed upon freshwater sponges. Four species are known in Australia. The Coniopterygidae are minute lacewings with snow-white wings, superficially resembling the Aleurodidae among the Homoptera. Australia has more than a dozen species; *Parasemidalis farinosa* is very abundant in some places.

The dainty little Hemerobiidae are well represented, especially by the hook-tip lacewings of the genera *Drepanacra* and *Drepanomina,* whose larvae feed upon lerp-insects on wattle and eucalyptus trees. The Chrysopidae (golden-eyes) are very abundant, though few have been described. These are among the most beneficial of all insects, their larvae destroying scale-insects and aphides wholesale. The rare insects of the sub-family Apochrysinae are also represented by a single species, *Oligochrysa gracilis.*

The remarkable Mantispidae, which have a close superficial resemblance to mantids, are not uncommon. Their larvae feed upon spiders' eggs. The largest species is *Mantispa australasiae,* which expands to more than two inches. *Calomantispa spectabilis,* from eastern Australia (shown on plate xix, fig. 26) is a little gem.

The slender and delicate lacewings of the family Osmylidae are not uncommon in Australia. *Porismus strigatus,* shown on plate xix, fig. 25, is a very pretty yellow-and-black species, often found in numbers on the trunks of trees. Its larva is long and slender, with very long jaws, and lives under the bark of trees. Most species are prettily-marked brown lacewings of the genera *Stenosmylus* and *Oedosmylus.*

Australia, especially in its dry central areas, has a large number of species of the true ant-lions (Myrmeleontidae), q.v. The allied Ascalaphidae are day-flying insects, with knobbed antennae resembling those of butterflies. Probably the most interesting and archaic genus in the world is *Stilbopteryx,* of which three species are known; their antennae are short, and they fly about swiftly in the dusk of evening, like large dragonflies. *S. napoleo,* from Western Australia, is shown on plate xix, fig. 28. The larva is a formidable-looking, black, spiny creature with an enormous head and jaws. Our commonest ascalaphids belong to the genera *Suhpalacsa* (a would-be humorous reversion of the European generic name *Ascalaphus*) and *Acmonotus.*

The delicate Nemopteridae, with their thread-like hind-wings, are confined to Western Australia and northern Queensland. The finest species is *Chasmopteryx hutti* (Spoon-winged Lacewing), a rare insect found occasionally near Perth.

See papers by Esben, Petersen, Froggatt, and Tillyard in the *Proceedings* of the Linnean Society of New South Wales. R.J.T.

Plant-breeding. Among the methods by which new varieties of plants are created, either naturally or artificially, is hybridization —taking pollen from the anthers of a flower of one species and placing it on the stigma of the flower of another distantly related. Thus the pollen of the Dog Daisy (*Chrysanthemum maximum*) of Europe, placed on the stigma of the Japanese Ox-eye Daisy (*C. Nipponicum*) produced seed from which was raised the well-known shasta daisy. The dog daisy was the male parent, the ox-eye daisy the female.

Plant-breeders also use the term for cross-breeding between two flowers of the same species (e.g. Farrer with his wheats), and for the raising of new plants by self-fertilization, followed by careful selection, or by cross-fertilization between two varieties or hybrids. Moreover, this transference of pollen may occur naturally, by the action of wind or insects. Among natural Australian hybrids the most noteworthy is probably the cross between the Kurrajong (*Brachychiton populneum*) and the Illawarra Flame-tree (*B. acerifolium*) which was given by von Mueller the name *B. populneo-acerifolium* and is commonly known as the Red-flowering Kurrajong. Among natural *Eucalyptus* hybrids is the cross between the Gray Ironbark (*E. paniculata*) and the Gray Box (*E. hemiphloia*) which has been given the specific name of *hybrida.* Several other eucalypt hybrids are recorded by J. H. Maiden.

In artificial hybridization the work of W. J. Farrer (q.v.) on wheats stands alone for its great economic value. In fruit-culture there has been no outstanding work, but excellent results have been achieved partly from chance seedlings and partly through careful selection —notably the 'Granny Smith' apple and 'Packham's Triumph' pear in New South Wales, and the 'Winter Cole' pear in Victoria. In floriculture several Australian hybridists have raised new plants of great value. Thomas W. Pockett has bred decorative Japanese *chrysanthemums* at Healesville in Victoria. At Bulla in the same State a new strain of *roses* has been raised by Alister Clark; he began with the pollen of *Rosa gigantea,* which has given to many new roses its charming foliage, vigorous habit of growth, and immunity from disease. Chief among these creations are 'Jessie Clark' and 'Black Boy' (climbers), 'Kitty Kininmouth' (pillar), 'Sunny South' and 'Lorraine Lee' (bushes), and 'Borderer' and 'Fancy Free' (dwarfs). In *daffodils* Leonard Buckland of Camperdown in Victoria has specialized in a red-cupped *Narcissus incomparabilis,* D. V. West of Casterton in trumpets of the 'Prince Alfred' type, and Alister Clark in the *Leedsi* varieties. H. B. B. Bradley of Sydney raised a new strain of *Hippeastrum,* breeding and culling them rigidly over a period of 35 years; he also, by crossing *Crinum Macowni* with *C. magnificum,* produced the finest hybrids of this genus yet raised. At his death all the plants and seedlings he had raised were presented by his widow to the State, and are now in the Sydney botanic gardens.

Among other Australian hybrids of note are *Hibiscus* George Harwood (*liliflorus* x General Courtegis), raised by G. Harwood; *Hibiscus* Rosy Morn (*liliflorus* x Conqueror), by William Selkirk; *Watsonia* Lady Fawkes (*rosea* x *coccinea*), by C. Weston; *Anthurium* T. Godwin (*andreanum* x *ornatum*), by A. D'Arcy; *Anthurium* Sir Hugh Dixson (King of Holland x *ornatum*), by T. Godwin. E.N.W.

Platinum. See MINERALOGY.

Platyhelminthes. See FLAT-WORMS, LIVER-FLUKES, and TAPEWORMS.

Platypus, or Duckbilled Platypus, vernacular name of *Ornithorhynchus anatinus* (once known as *O. paradoxus*), one of the three known representatives of the mammalian sub-class Monotremata, the most primitive of mammals (see plate xxxviii). It has a short, thick trunk and short, powerful limbs. A full-grown male is about two feet long, a female 19 inches; of this length

PLATYPUS

Plate XXXVIII

Platypus (male) at rest, showing position of fore-paw while bearing weight.

Photos. by H. Burrell. Platypus (female) leaving nest which has been exposed.

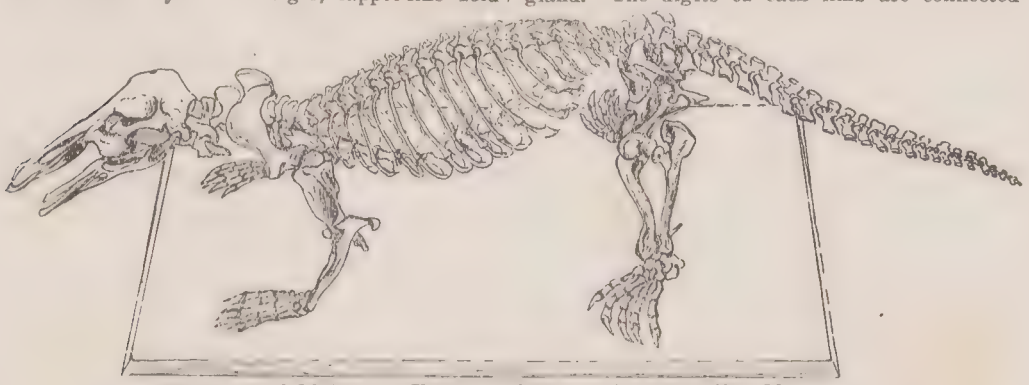
Plate XXXIX

PLATYPUS BURROW

From model by H. Burrell.

Bird's-eye view of river-bank, showing platypus burrow winding 40 feet from entrance to nesting-cavity. (Scale about ¼ inch to 1 foot.)

the tail accounts for about six inches (male) or five (female). The whole surface, except the bill and feet, is covered with a coat of velvety fur, a rich brown above and grayish-white below. The snout and upper jaw are developed into a structure roughly resembling the bill of a duck, and are covered with a smooth hairless integument, black above and flesh-coloured or cream below, often mottled with dark-slate markings, and develops into a free flap at the base in front of the eyes. A larger, lappet-like fold covers the lower portion of the face, so that the animal's face is protected by the two flaps. Small, bead-like eyes and the absence of conspicuous outer ears enhance the duck-like appearance of the head. The mouth is a wide aperture, the tongue not protrusible. Both pairs of limbs are short, with five digits on each limb, all terminating in horny claws. On the inner side of the hind-limbs occur large curved and pointed horny spurs, connected with an internal gland. The digits of each limb are connected



Skeleton of Platypus. From specimen in the Australian Museum.

by a leathery flap, which in the fore-limbs extends beyond the ends of the claws; but the extension is flexible, so that it can be readily folded inwards when the animal is burrowing. These flaps convert the limbs of the platypus into very efficient swimming-organs; at the same time the strong claws adapt them for use in excavating the burrows in which the animal takes refuge. The tail is somewhat flattened, and, except in old animals, thickly covered with fur towards the end.

The burrows of the platypus—first explored by Dr. George Bennett, who described them in his *Gatherings of a Naturalist in Australasia*, and more recently by Harry Burrell, who describes them below—are excavated in the banks of streams. They are of two kinds, living-burrows and breeding-burrows. See MONOTREMES.

W.A.H.

Investigators and observers have described the platypus as 'swimming' about the surface of a pool with its sensitive beak below the surface of the water. Their observations must have been made in daylight, when these nocturnal animals are most cautious and almost sightless. At that time the platypus deliberately semi-submerges itself, so as not to expose above water any more of its body than is absolutely necessary for comfort while grinding its food, listening, and breathing. It is merely floating, turning, and loitering, while it leisurely masticates the assorted foods previously collected and stowed away in the true cheek-pouches by the aid of twin horny projections of the tongue.

Progress along a river or pool is made principally while the animal is puddling in the muddy bottom, fossicking for food; and swimming is indulged in only when it is sounding, or ascending for an occasional breath of air while it drifts. The time spent below is regulated by the quantity of food discovered during the submergences, which range from one to five minutes (averaging two). Six minutes' entire submersion means death, even to a robust platypus.

As far as is known, the animal, while puddling, relies entirely on the sensitive touch of its lips (the projecting sensitive skin that surrounds the bill) to secure its prey. The small eye-and-ear orifice is tightly enclosed in a lengthy slit which acts as eyelid and ear-lid in one, preventing the entrance of sediment. The nostrils, situated dorsally and close to the midline of the fore part of the nuzzling muzzle, are kept free from silt and sediment by an occasional exhalation of air which has been stored in the animal's lungs. Out of the five senses serviceable above water, four are completely dispensed with (or short-circuited) below, and energy is concentrated on the delicate sense of touch. The platypus does not de-pouch its assorted tit-bits for mastication until it ascends to the surface; there it systematically separates and devours the palatable food, and rejects at leisure the haphazardly collected foreign matter. When above water, the sense of hearing at least is remarkably acute. The platypus is semi-nocturnal in habit, and does not venture out during the day, except in lean seasons, when food is scarce. At such times the writer has repeatedly tested the eyesight of floating platypus, and has proved that they can see slightly at midday, especially at close quarters and when their attention has been first attracted by some unusual sound.

The platypus does swim along the surface, but not in the manner recorded by previous observers. Only during the breeding-season—or in the stillness of night, when the animal's sight is normal—does it disport itself obviously, with impunity, and regardless of all diurnal enemies. When not in quest of food, it swims rather rapidly on the surface, somewhat like a wary duck making for its nest. Action, attitude, and pace are duck-like. A portion of the back, and the bristly hairs of the tail, are exposed above the surface; the neck is comparatively sleek and erect, and the head is carried parallel with the stream. The stroke action of the fore-limbs is dog-paddle-like—by one limb at a time; and possibly alternate movements of the hind-legs occur at the same time. Action is continuous and noiseless. A shocked or infuriated platypus can, practically speaking, run

along the surface of the water, and resembles a heavy sea-bird, when suddenly surprised, scurrying along calm waters.

A platypus can bite with its ridged mandible, and will do so if exasperated, whether in captivity or at large; what is more, it will deliberately charge and savagely snap at its tormentor, snarling or hissing the while. Nesting material is cut up with the mandibles, and stiff stems and bark fractured and fuzzed to desire, to furnish and fit the rounded nesting-cavity.

The female platypus alone is responsible for all parental duties, such as excavating the breeding-burrow, tending the young, and (possibly) making the snug bird-like nest. The male, like most mammals, is simply a 'hanger-on;' he is certainly so during the rutting-season, which usually includes the months of July, August, and September. The movable spur of a male platypus is so placed that it can be used as a thumb wherewith to embrace the ankles of the female; this is, indeed, its chief use—except for combat with pugnacious rivals. All young, when hatched, are fitted with spurs; but in immature females they disappear, and the sac-like sockets that take their place are either the sockets in which they worked or the spurs themselves, altered by introversion so as to receive the tip of the male spur during copulation.

The kidney-shaped poison-glands connected with the spurs are concealed beneath muscles that lie at the dorsal aspect of the lumbar region; a duct runs from each along the hind-leg to the hollow spur. The orifice of the duct is situated slightly to one side of the spur-point, and under natural conditions the poison is ejected in measured doses. The platypus does not strike; he grips, taking hold with his curved claws and pressing the under-surface of the foot closely against his adversary, while with a powerful twist of the ankle he drives his spur probe-fashion into the part grasped, and ejects the poison. The whole action ludicrously resembles a hearty hand-shake—a friendly grip, followed by a squeeze of the hand with the in-turned thumb thrust against the palm.

Burrows.—The ordinary burrow is a simple affair, always with an entrance above the water-level, but occasionally with another under water. It is made (usually beneath the roots of a red gum) in the bank of some long, deep pool where food is likely to be plentiful. But the breeding-burrow is a very different matter. A quiet part of the stream is selected—preferably a shady pool with steep, sloping banks strengthened by the roots of eucalypts or river-oaks, and margined with reeds. When first put into the face of a bank, the entrance to a breeding-burrow varies in height from six inches to 15 feet above the then water-level. The selected site is conspicuous, and not camouflaged by herbage, although herbage may be growing abundantly close to the bare patch in which the animal has begun to tunnel. The shape of the entrance (and of the tunnel as a whole) corresponds with the cross-section of the animal's body, rounded above and flattened below. The tunnel ranges from 14 to 60 feet in length, winding erratically to left or right as obstacles and earth conditions compel; it averages 15 inches below the surface, following the sloping contour of the bank, and terminates as soon as a subsoil is met with in which the rounded nesting-cavity can be formed without fear of collapse. Provision for ventilation in a breeding-burrow, if not a lost art, is certainly overlooked.

The burrow illustrated on plate xxxix trends to the left until the roots of a she-oak are met with, then veers to the right until she sounds a somewhat similar obstacle (root of gum-tree), thence on a clear run until striking inferior soil (at mattock handle) where it terminates in a blind end. Here the animal backs out clear of the first rock soundings, then forges ahead in an opposite direction between rocks, and on again up the bank, where the burrow comes to another blind end on the platypus sounding a rabbit burrow. Backing out from this unforeseen obstacle, she digs her way between more rocks, and heads once more for the summit of the bank, only to sound the rabbit burrow again; but this time the haphazard rodent's burrow is found sufficiently elevated to induce her to tunnel under it, still keeping 12 inches of soil above her workings and rising ultimately at the other side (close to shovel) to her customary level. Here she puts in her last winding lead, carefully avoiding the roots of a felled tree on the right (near the top corner of the collector's excavation) and makes her nesting cavity 12 inches beneath the virgin surface of the steep slope. The three small cavities in the burrow not already mentioned are 'pug-pits,' from which the soil is taken for the purpose of forming the pugs when the burrow is in use. In the plate the soil is removed to expose the system of tunnelling, the area being about 12 feet x 24 and the depth 1 foot.

A platypus, when burrowing, folds its swimming membrane back into the palm of its splayed fore-paws, leaving the broad cutting-claws free to excavate the earth. After it has burrowed a short distance inwards, it tamps the loose earth back into the section of tunnel already excavated. Not until the nesting-cavity is at least partly excavated can the animal turn round comfortably in its quarters; then it immediately traverses its subway to clear away all freshly scattered soil from the main entrance. It next brings in nesting material—any suitable litter of growth obtainable close at hand, such as the fibrous roots of willows and reeds, willow-switches, strips of soft bark, reed-stems and flags, couch-grass trailers, and eucalypt twigs. Most nests are composed principally of eucalypt leaves and couch-grass trailers. When the nest is completed, the platypus proceeds to pug the subway sections, two to four in number. Entering the tunnel from outside, she scratches fine earth from the side-wall at the first bend, and with it pugs up section number 1 by backing and flicking with her tail. At the next convenient turn she creates a similar pit and pug-up, and so on until she reaches the terminal chamber; the final pug is securely arranged within a few inches of the now practically air-tight cavity. Then she wriggles herself comfortably into the centre of the snug bulky nest, coils up into a ball, and deposits her egg or eggs between her webbed palms on the slightly concave smooth surface of her tail—which, when clasped to the body, provides a temporary pouch. Forthwith she goes to sleep—probably not to awake until the eggs have been hatched and the young are about a week old, by which time her capacious milk-glands have developed sufficiently to nourish her progeny through the perforated skin on either side of her abdomen.

When the young ones have grown sufficiently robust to suck, the mother frequently leaves them securely pugged up in the chamber while she goes feeding. When they are beginning to

grow fur, and up to the time when they deliberately forsake the burrow for more convenient quarters, she does not enter the nest at all—at least during the day. But from the time when the nest is complete until the young are able to see and almost to fend for themselves, she always, when leaving or entering the burrow, pugs up the subway securely behind her, first tunnelling through and then backing to trowel (or flick) the disturbed pug again into position.

The female platypus lays from one to three eggs, two being the normal clutch. Twin eggs are always found adhering to each other, side by side. In the case of triplets, each egg may adhere to both its neighbours, forming a complete cluster; but this is not invariable. The average length of egg is 16 mm. (about two-thirds of an inch), breadth 12 mm. (nearly ½-inch), length of newly hatched young, 18 mm. (seven-tenths of an inch).

See Burrell's *Life History of the Platypus* (Sydney, 1926). H.B.

Playford, THOMAS (1837-1915), born in London on 26 November 1837, was brought by his parents to Adelaide when only six years old. His father (also a Thomas Playford, born in 1795) served in the army when young, and was present at Waterloo, but in later life became a Methodist minister and for 30 years officiated at a church in Adelaide. The son was educated at Mitcham, and for some years was a farmer and gardener at Mitcham and Norton's Summit. In 1868 he was returned to the legislative assembly from Onkaparinga as a land reformer, and helped H. B. Strangways (q.v.) to carry his land act of 1869; in 1871-5 he was out of parliament, but in the latter year was elected for East Torrens, transferred himself in 1887 to Newcastle (South Australia), and in 1890 returned to East Torrens and sat for that constituency till 1894. During those years he frequently held office—as commissioner of crown lands in the Boucaut ministries of 1875-6 and 1877-8, the Morgan ministry of 1878-81, and the Colton ministry of 1884-5 (in which he was for a time commissioner of public works), as premier (with C. C. Kingston as his right-hand man) in 1887-9 and 1890-2, and as treasurer in the Kingston ministry of 1893-9. During his 1887-9 premiership he carried the first South Australian protective tariff. He resigned the treasurership in 1894 to become agent-general for the colony, and held that position for four years. Meanwhile he had actively interested himself in the federal movement, had represented his colony on the federal council in 1889, at the Melbourne conference of 1890 (as leader of the opposition), and in the convention of 1891, and on his way to England in 1894 had attended the colonial conference at Ottawa. In the conference of 1890 he was a leading figure, heartily supporting federation within the Empire, but correcting, by a full exposition of the practical difficulties, the exuberant eloquence of other delegates; the value of his work there and at the convention of 1891 is well explained in Wise's *Making of the Australian Commonwealth.* Returning to South Australia in 1898, he was in 1901 elected to the federal senate and was vice-president of the council in the Deakin ministry of 1903-4, and minister for defence in that of 1905-8, but was defeated at the elections of 1906 and resigned his office and left politics in January 1907. He died at Adelaide on 19 April 1915.

Plectoptera, a very ancient order of insects, usually known as may-flies or ephemerae, which has no near relatives existing and no affinities to any other order except the Odonata. It is represented by about 500 species of delicate gauze-winged creatures whose vernacular name implies their brief existence in the adult stage. Australia has no conspicuous species, and only 16 in all have so far been described, though it would be possible without much trouble to obtain a good many more.

Of the seven families into which the order is divided only three—the Leptophlebiidae, Siphlonuridae, and Baëtidae—are known in Australia; the last-mentioned family is represented only by three minute species introduced from Malaysia. The Siphlonuridae are abundant and of large size in New Zealand, and similar forms may be looked for in all elevated regions of south-eastern Australia; fine larvae, indeed, have already been found on the Blue Mountains of New South Wales and in Tasmania, but have not yet been bred out. Only two species have as yet been described—*Coloburiscus haleuticus* from Victoria, and *Tasmanophlebia lacustris* from Tasmania (shown on plate xix, fig. 14). All the other species described belong to the Leptophlebiidae, the genus *Thraulus* claiming one, *Euphyurus* two, and the dominant genus *Atalophlebia* eight—but this is only a fraction of the actual number belonging to this genus in Australia. The larvae are conspicuous objects in all running creeks, very active, and often found clinging to the under-side of rocks where the current is fast. They may be distinguished at once by their three very long, slender caudal filaments, and by the six or seven pairs of tracheal gills arranged segmentally along the sides of the abdomen. Each gill consists of a pair of leaflets, usually lanceolate in form; but in some species one of them may be deeply multifid. The larvae have strong mandibles, and are carnivorous, feeding upon living or dead insect-larvae and frequently indulging in cannibalism; many have a very complicated colour-pattern of browns and blacks. The sub-imagines are always dull-coloured, the wings being either brown or ochreous. They fly straight out of the water, and rest upon a rock or the leaf of a tree for about two days. At the end of this time the imago emerges, a glittering, clear-winged creature which loves to dance in the evening sunlight over the rock-pools. These imagines certainly live a week or more, which is longer than

Atalophlebia australica (at rest).

usual for this order. The commonest species is *Atalophlebia australica,* a fly of about ¾ inch expanse, with a rich brown body and a dark brown band along the costa of the fore-wings. The hind-wings are, as usual, very small; the two outer caudal filaments are immensely long and strong, but the middle one is either absent or much reduced in size. This species is figured (enlarged) in the text-figure.

See Eaton's 'Monograph of the Ephemeridae' in the *Transactions* of the Linnean Society of London (1883-8); and Ulmer's work in *Fauna*

Süd-west Australiens (1907) and *Results of Mjoberg's Swedish Scientific Expeditions to Australia* (1917). R.J.T.

Plovers. See WADERS.

Plum, a name applied to several trees outside the genus *Prunus*, which is not represented in Australia. The black plum is a *Cargillea* (see EBENACEAE); the Queensland and sour plums are species of *Owenia* (q.v.).

Plums. See FRUIT-GROWING.

Plunkett, JOHN HUBERT (1802-1869), born in county Roscommon in Ireland in June 1802, educated at Trinity College, Dublin (B.A., 1824), and called to the Irish bar in 1826, threw himself at once into the agitation for Catholic emancipation and by his influence determined in favour of the Irish Catholics a critical election in 1830. In 1831 he was appointed solicitor-general of New South Wales, and reached Sydney in June 1832. In 1833 he was directed, much against his will, to relieve John Kinchela (q.v.) of all court work, and in 1836 succeeded him as attorney-general; this position he held for nearly 20 years, including a visit to England in 1841-3, during which he was consulted about the framing of the 1842 act for the better government of the colonies. He was a member of the old legislative council from 1836 to 1841. In August 1843 he was appointed a nominee member of the new council, but for a few months did not take his seat owing to an irregularity in the appointment. In 1848 he became chairman of the board of national education. In 1856, on the grant of responsible government to the colony, he retired on a pension, but stood for election to the new assembly and was returned by two constituencies, choosing to sit for Argyle. In January 1857 he resigned this seat on appointment to the legislative council, of which he was made president. In February 1858, however, he quarrelled with the premier (Charles Cowper) over an educational matter, was removed from the chairmanship of the board, and resigned his other offices, returning to the assembly (1858-60) as member first for Cumberland and then for West Sydney, and then retiring to the council, of which he was a member till his death. He represented the Martin ministry in the council from October 1863 to February 1865, and—having been reconciled to Cowper—in the hope of diminishing the evils of party government joined the succeeding Cowper ministry in August 1865 as attorney-general; but when, on the fall of that ministry the next year, he found himself unable to effect a Martin-Cowper coalition, he left politics and spent most of his remaining years in Melbourne, where he died on 9 May 1869. In 1835 he published at his own expense *The Australian Magistrate*, and in 1863 *The Evidence of Accomplices*. He was one of the original members of the senate of the university of Sydney, and from 1865 till his death was vice-chancellor.

Podargus. See FROGMOUTHS AND NIGHTJARS.

Poison-bush, a name applied (with distinguishing epithets) to indigenous plants of several families, sometimes inaccurately, sometimes because at certain seasons they are toxic though normally harmless. The bloom poison-bush is an *Oxylobium*, as is the box poison-plant; the Candyup poison-bush is a *Stypandra*; the dogwood and Ellangowan poison-bushes are species of *Myoporum*; the peach-leaved poison-bush (which is not toxic, but so fibrous in texture as to produce indigestion) is a *Trema*; the river poison-tree is an *Excaecaria*. Many species of *Gastrolobium* have, and nearly all species deserve, the same name; and other leguminous plants—e.g. the Darling pea, q.v.—have similar qualities.

Polding, JOHN BEDE (1794-1877), born at Liverpool in England on 18 November 1794, left an orphan at an early age and adopted by his uncle Dr. Brewer (who was president-general of the English Benedictines), was educated at Acton Burnell in Shropshire, admitted to the Benedictine order in 1811, and ordained priest on 4 March 1819. Appointed prefect—and later novice-master—of St. Gregory's College at Downside in Somerset, to which place the Acton Burnell school had been transferred in 1814, he embraced this work with a zeal that made him decline the offered bishopries of the Mauritius and of Madras. When, however, it was decided at Ullathorne's earnest request to detach Australia from the diocese of the Mauritius, and the new missionary bishopric was offered to him, Polding (who from youth had dreamed of work in Australia) yielded, and on 29 June 1834 was consecrated bishop of Hiero-Caesarea *in partibus infidelium* and made vicar apostolic of New Holland and Van Diemen's Land.

Reaching Sydney on 13 September, Polding at once set himself to provide an embryo organization for the vast diocese in his charge. This, however, was probably the least arduous of his duties; his most strenuous and remarkable work was done among the convicts, especially the new arrivals. Obtaining permission from the governor to have all Catholic newcomers left in his charge for a few days, he used to give them personal advice and exhortation both on religion and on their future behaviour and prospects, to such good purpose that only one or two out of thousands became criminals within the colony. The time not thus employed he spent in visits to the chain-gangs and road-gangs, or in long journeys to the settlements inland, well earning the praise later given him as 'the greatest missionary of the age.' On 29 June 1836 he consecrated the cathedral of St. Mary at Sydney, begun in 1820 by Father Therry (q.v.). In 1841 he visited Europe, and while in Rome was made (20 July 1842) archbishop of Sydney and metropolitan of Australia; this use of local names was thought by some opponents of his Church to be an infringement of the rights of the Anglican Church, and a formal protest was made by Bishop Broughton, without effect. Other visits to Europe, each resulting in the introduction to Australia of new agencies for religious work, were paid in 1846-7 (when Polding was given a coadjutor bishop), 1854-5, and 1865-7. In 1869 he left Australia to attend the Vatican council of 1870, but was unable at his age to stand the tropical heat, and returned to Sydney from Aden. He died at the Sacred Heart presbytery in Darlinghurst on 16 March 1877.

Of Archbishop Polding's work it is difficult to speak without appearing to exaggerate. When he reached Sydney in 1834, his Church was served by three priests, and he brought three more with him. By the end of his life the territory first placed under his jurisdiction had been divided into 12 dioceses—Sydney (1834), Hobart (1842), Adelaide (1844), Perth (1845), Port Victoria (1847), Melbourne (1848), Maitland (1848), Brisbane (1859), Bathurst (1865), Goulburn (1866), Armidale (1869), Ballarat (1874), and

Sandhurst (1874); and in the archdiocese of Sydney—a mere corner of his original diocese—there were 82 churches and 53 schools. Of his personal qualities contemporaries relate that his learning was equalled only by his industry and excelled by his piety. Richard Windeyer in 1843 described him as 'the person who possessed the greatest share of dignity and commanded the greatest respect and influence in the colony.' 'In his own Church,' wrote an Anglican in 1859, 'he is adored, in ours he is admired.' But nothing short of the full story of his life in Australia—which may be found in Birt's *Benedictine Pioneers*—can do justice to his worth and achievements.

Christened 'John,' he adopted the name 'Bede' at his entry into the Benedictine order. See ROMAN CATHOLIC CHURCH.

E.M.O'B.

Police. In the early years of Australian settlement, as in the England of those days, the maintenance of public order was purely a military matter. (It will be remembered that during the trial of Queen Caroline London ran grave risks because the guard regiments, which were relied on to maintain order, sympathized with the queen; the London police force originated from the Duke of Wellington's report on this episode.) Governor Phillip in August 1789 appointed a night-watch, selected from the best-behaved of the convicts; this grew into a so-called 'constabulary,' with constables stationed at Parramatta, Toongabbie, and the Hawkesbury as well as at Sydney. Hunter, finding in 1796 that at Sydney at least this force was not to be trusted, substituted for it a system whereby the town was divided into areas whose inhabitants had to choose three 'decent and respectable' fellow-residents as watchmen. On 1 June 1801 King ordered a weekly inspection of the 'police' at George's River and of the watchmen in Sydney. The police were under military control, supervised by John Harris, who was police magistrate at Sydney as well as surgeon of the New South Wales Corps; in 1802, when Paterson objected to the use of military officers for civilian duties, King discharged Harris and put Paterson himself in charge of police affairs—whereupon Paterson begged that Harris should be reinstated, and King, after a long delay—designed to teach Paterson a lesson—on 8 June 1804 granted the request. In 1807 Bligh dismissed Harris, replacing him with Robert Campbell, but in January 1809 Paterson put Harris back. His departure for England as a witness in the trial of Colonel Johnston gave Macquarie a free hand with the police. For a year he used patrols of his own regiment to maintain order in the streets at night, but on 1 January 1811 established a system of semi-civilian constables under a superintendent—D'Arcy Wentworth (q.v.) was the first—who was given 'power to punish all prisoners, freemen, rogues and vagabonds,' and had to keep a list of all householders and a 'black-book' of all offences and offenders. Sydney was divided into five districts, seven constables being allotted to each; at night the patrols 'called' every half-hour, and saw to it that householders closed their houses at a reasonable time. This system revived the principle of the curfew, and of hour-calling, but was progressive in that it provided civilian control under a single head.

For many years afterwards such changes as were made were the result rather of an alteration in material conditions than of any deliberately intended reform. The most important was the creation of a body of mounted police for service in country districts. When settlement began to spread beyond the Blue Mountains westwards, and up the Hunter valley to the north, it became obvious that some such body was needed to protect settlers from the convict bushrangers, and to regulate their relations with the aborigines. Accordingly, Governor Brisbane in 1824 organized a mounted police force by drafting from the troops in the colony (all infantry) men who could ride; they remained subject to military law, and wore a semi-military uniform. As the roads lengthened, and as the transport of valuable produce to Sydney grew in importance, the mounted police were called upon to protect it while in transit, and in several districts thus almost imperceptibly found themselves converted into the renowned 'gold escort.' For work of this kind the semi-military organization was most suitable, and it was not till well into the seventies that the mounted police became thoroughly civilianized.

With the appointment of J. T. Morisset in 1828 a more modern type of superintendent arrived, and further improvement resulted from an act of 1833 'for Regulating the Police in the Town and Port of Sydney.' This was followed in 1838 by another dealing primarily with the Hawkesbury; in 1840 increased powers were given to the water-police magistrates, and in 1842, when Sydney was incorporated, it was required to contribute 'one moiety of the cost of police'—a responsibility protested against and for some time evaded. On 1 January 1851 William Spain was appointed inspector-general, but retired at the end of the year. William Colburne Mayne followed him, and was succeeded in 1856 by John McLerie, who had been adjutant of mounted patrol, then governor of Darlinghurst gaol, and then superintendent of police. The uniforms worn at this time by police were:—ordinary, black coat, white trousers, 'bell-topper' hat; mounted, full dress, 'a becoming military uniform similar in every respect to that of the 13th light dragoons;' gold escort, a nearly full military uniform of similar character, described by Superintendent McLerie as 'most unsuitable.' The establishment of a true police-force in New South Wales was initiated by the police regulations act of 1862, which enacted that the inspector-general, under the direction of the colonial secretary, should control the entire police of the colony, making all appointments except those of inspectors, sub-inspectors, and the immediately subordinate grade of superintendents (in these cases the inspector-general recommended, and the governor-in-council appointed). The consolidating act of 1899 made no change in the system; in fact, the only important alterations since 1862 are a modification of the superannuation conditions in 1906, and the institution of a police appeals board in 1923. This board, and the formation of a police union, limits the autocratic power of the inspector-general without altering the principle of undivided control for the State.

The act of 1862 also put a definite term to the pretensions of the water police, and, more particularly, to the independent authority exercised by water-police magistrates. As at first Sydney consisted of little more than the waterfront, and as the perpetual arrival and despatch of government ships, arriving with convicts and leaving with time-expired troops, was the main event, in every sense, of the early years of

the colony, there had not unnaturally grown up a certain sort of precedence which made the 'water-police court' and its officers count themselves as of a higher grade. The act definitely reduces them to their proper level of subordination, and places them by special mention under the absolute control (so far as the police) of the inspector-general. Subsequently there grew up another and special body of water police and a special court, and a certain segregation of duty. On 1 September 1926 the strength of the New South Wales force was 2928, inclusive of 33 trackers.

Victoria.—In March 1837 Melbourne was guarded by one district and two ordinary constables; by October there were seven, but Lonsdale considered this force to be inadequate and procured several mounted men from Sydney. Disliking their appearance, he demanded that they should be supplied with some recognizable uniform—a scarlet waistcoat, he thought, would suit them well. It would seem that nothing came of this, for in the early forties the Melbourne police had a uniform of dark blue with pewter buttons and a top-hat with a glazed leather crown and upright side-bars of iron to protect them against brickbats and bottles. Throughout the Port Phillip district the bulk of the force was aboriginal, with white officers, but at Melbourne and Geelong a certain number of 'border police'—enlisted from refractory soldiers and ticket-of-leave men—were on duty; these, however, were disbanded towards the end of the forties. The first head of the Port Phillip police was Henry Batman, brother of the more famous John; he was not a success. Henry Pulteney Dana was the first head of the native police.

The sudden rise of Melbourne in 1852 to the status of a city—and a populous one—necessitated the creation of a genuinely civilian police force. The colonial office was asked to procure from the English and Irish police a number of trained men, and 50 constables arrived in the *Bangalore* and *Exodus* under a ten years' engagement, with the right to remain in the colony. Under Samuel Freeman (an imported officer) this nucleus expanded into a properly constituted and uniformed force of the true British civilian type. Despite the handicaps of poor material and of commissioners who—excellent officers though they were—had no sympathy with civilian organizations, Freeman successfully insisted on the extirpation, in Melbourne, at least, of the military ideals; the country districts he wisely left in charge of the military-minded officials. The native police, whom Dana had made into a fine body, began to decay after his death in 1852, and were soon extinct; they were revived more than 20 years later to deal with the Kelly gang.

With all Freeman's success, won against heavy opposition, the old type persisted in his superiors. The first three chief commissioners, H. F. Mitchell (1853-4), Charles McMahon (1854-7), and Frederick C. Standish (1858-80), were all of the military type and tradition. The first 'policeman' to hold office was H. M. Chomley (1881-1902). The higher air long remained too rarefied for a 'policeman' to breathe, yet even the chief commissionership capitulated at last.

Freeman's work is the more valuable because under him, directly or indirectly, all those who organized police in the other States (and even in New Zealand) were trained. Thus Edmund Fosbery, the first dominating inspector-general in New South Wales, was a Freeman-trained man; and Queensland and other colonies gladly borrowed from Freeman's staff men to set in order their own police establishments. In the sixties, however, through no fault of its author Freeman's organization in Victoria became less effective, and disorders arose which it took many years of stern effort to correct.

Police organization in the other colonies has less historical interest. *South Australia* consolidated a little later than Victoria: her system derives directly from Victoria: she has made two changes only; of these one is merely a matter of title—her head is styled 'commissioner;' the other, of more interest, that special constables cannot be created except by leave of the ministry of the day—a slight intrusion upon the absolute power of the commissioner. In South Australia the cost of the police force is divided equally between the district and the general revenues.

Queensland's consolidating act, passed in 1921, adds nothing of real moment. The strength of the Queensland force is 1113, i.e. 1 to every 762 of the population, almost the same proportion as in New South Wales; the cost is slightly higher than that in New South Wales. In *Western Australia*, considering its huge area, the cost is relatively low, and the proportion to inhabitants remarkably so. *Tasmania's* cost per head is the lowest: the ratio to population the highest except that in Victoria.

Native Police.—This force, which was in the early days separate and important, has disappeared from most States, but remains in Queensland and the Northern Territory. Native police must not be confused with black trackers (q.v.). In the Northern Territory there are 40 white and 40 native police, with varied duties, ranging from clerks' work to the dipping of cattle for ticks. Much of their time is taken up in finding and relieving parties of would-be explorers.

Commonwealth Police.—The Federal and Northern territories are policed by forces under Commonwealth control; expenditure in the Northern Territory is exceptionally high in proportion to the population—about £4 10s. per inhabitant—but this is unavoidable in a vast and scantily populated area. Further, police duties there consist largely of supervision of the aborigines, always a costly work. On special occasions small forces of Commonwealth police have been enlisted for work in the States—by W. M. Hughes when prime minister in 1917, and by Stanley Bruce, the present prime minister, in 1925; the last-mentioned force, required because the premier of New South Wales refused to allow the State police to act in certain Commonwealth matters, was officially named 'Commonwealth peace officers.' The Hughes force was disbanded when no longer required, and Bruce's force has been absorbed into the Commonwealth attorney-general's department.

Women Police.—In all the States except Queensland women police are employed, always in metropolitan areas and usually on preventive work only. Their superiors in South Australia (which has 10 of them) and Western Australia (which has 6) consider their work useful and important; New South Wales and Victoria have 4 each and Tasmania 2.

Police Associations.—Throughout Australia the police have been allowed to form what are virtually unions. In each State there is a police association; but, except in Queensland, these

associations have no access to the arbitration courts, and so the name 'union' has been carefully avoided. The Queensland association, however, makes full use of the arbitration court, and decisions to its advantage secured in Brisbane have a strong influence on police conditions in Sydney and, to a less degree, in Melbourne. Except for this access to arbitration courts the New South Wales association is typical. It is open to all members of the police 'of and under the rank of sergeant, 1st class.' Its executive is elected from the members, and its funds are vested in trustees. It may conduct business enterprises (e.g. the publication of a newspaper). Its objects are 'to promote by every means, consistent with the Regulations and with loyalty to throne and government, the interests of the Police Service, to afford means of discussing any matter relating to the general welfare of the police, to consider any grievance or complaint affecting the Force, and obtain redress through the proper channel, and finally, to encourage esprit de corps.' H.A.T.T.

In November 1902 the Victorian parliament passed an act abolishing pensions for members of the Victorian police force and substituting a compulsory scheme of insurance. This change did not prove altogether a success. Men joining the service found that, while one section was entitled to a pension on retirement, another was not; consequently there arose a certain discontent. For 20 years deputations waited on successive governments in the vain endeavour to obtain pension rights for the non-pensioners.

Shortly after the appointment of Chief Commissioner Nicholson (11 April 1922) four senior constables were appointed as special supervisors. These went in plain clothes from district to district in the metropolitan area to see that constables were properly performing their duties. To such supervision a number took exception, and among them there was drawn up a petition for the redress of what they termed legitimate grievances. This was signed by over 600 men, who pledged themselves to stand firmly by it and its consequences.

On 29 October 1923, 29 uniformed men, who were due to parade at Russell Street for night duty, refused to fall in for the roll call. The chief commissioner was informed, and hastened to the barracks. On arrival, after meeting with a hostile reception, he stated that he would remove the supervisors for the night and would consult the premier in the morning. The men then fell in and went on their beats. A conference took place between the chief commissioner and the premier, H. S. W. Lawson, who decided that the men must return to duty unconditionally while he placed their complaints before cabinet.

On 1 November the same men refused duty at 10 p.m., and the chief commissioner again went to Russell Street. The outlying stations had been instructed to send men to the barracks for duty, but on arrival these joined the strikers. After a futile attempt to address the men, the commissioner dismissed the two ringleaders, and discharged the others. During the night some of the seceders travelled from district to district in a motor-car, persuading the men on duty to cease work, and informing them that a mass meeting would be held in the morning. This meeting was largely attended, and, against the advice of several speakers, carried a resolution not to return to duty. There followed negotiations with the premier, but he remained firm, and that night the city went unpoliced. The following morning the chief commissioner and the attorney-general, Sir Arthur Robinson, addressed a number of men who had arrived at Russell Street from the country, with the result that most of these remained loyal. The mounted men and recruits in training were then addressed on the seriousness of the position, and besought to stand firm; but they joined the strikers, and left the depot.

On Saturday evening the city was crowded with visitors attending the spring racing carnival. The traffic became confused through the absence of traffic police; the rowdy element took charge of the city, and windows in the main thoroughfares were broken and goods stolen from shops. The detectives and plain-clothes men, assisted by the uniformed men who remained loyal, did yeoman service, and many arrests were made. Sunday saw a recurrence of rowdyism. The position was very serious. Cabinet met and decided on the formation of a special constabulary force under Major-general Sir J. W. M'Cay (q.v.). Volunteers enlisted in large numbers; prominent business men and their employees joined up. Depots were established, and the specials, armed with batons, for some weeks effectively policed the city and suburbs. This force was augmented by police pensioners who had been recalled for duty. The work of reconstructing the permanent force then began. By recruiting in both the country and the metropolitan area, a permanent force was soon in the making, the accepted candidates being put through intensive training and drafted to stations. These men, considering the short period of training, did remarkably well. Meanwhile the discharged men formed themselves into what was known as the Discharged Police Reinstatement Association.

Overtures made to the government on their behalf met with no success. In 1924, upon a change of government, a royal commission was appointed to enquire into (*a*) the general state and efficiency of the police force prior to November 1923; (*b*) any alleged grievances prior to that date; (*c*) the causes moving members of the force to refuse duty or strike in that month; (*d*) the consequences arising from such refusal or strike. General Sir John Monash was appointed chairman of the commission, 54 sittings were held in public, and 115 witnesses were examined.

The commissioners reported, *inter alia*:

> Having had a number of strikers before us as witnesses, and having had an opportunity of noting their demeanour and personality, we were surprised that such a large body of men who are above the average in intelligence, judgment, and experience, should have permitted themselves to be carried off their feet and to prefer to follow a self-constituted leader like Brooks rather than their own elected representatives on the Police Association. The motives which actuated these men were many and varied. Some, doubtless, had resentment at the system of supervisors uppermost in their minds; others either surrendered their judgment altogether, merely blindly following the crowd, or were actuated by a definite view that loyalty to comrades, right or wrong, came before loyalty to their service; while no inconsiderable number joined the strikers mainly out of fear of the consequences to themselves of remaining loyal to the service.

A.H.MacK.

Police Fund, The. The expenses of the early settlement were a charge on the British budget—which meant that the naval governors had to obtain leave from London before any important work could be carried out. The pro-

ceeds of the few customs duties that were levied at Sydney and Hobart were for the most part used in the upkeep of the female orphan school. Macquarie, from the first eager to make improvements without the delay involved in obtaining approval from London, determined to create a local fund for that purpose; on 3 March 1810 he doubled the duty on imported spirits (bringing it up to 3s. per gallon), and on 31 March allotted one quarter of the thus augmented customs revenue to the orphan school, and with the remainder established a 'police fund,' of which a mere modicum was to be spent on police. Out of it were 'to be defrayed the Expence of the Jail and Police Establishments, the Erection of Wharves, Quays, Bridges, and the making and repairing of Streets and Roads within the limits of the Town of Sydney.' In October 1810 market tolls and dues were also allotted to the fund, and it soon became a sort of colonial treasury. Liverpool in 1812 saw with apprehension the creation of such a fund, and, while he sanctioned it for the moment, warned Macquarie that very soon it must be used to relieve the British Treasury, not to finance a large public works policy; if the free settlers, he said, cannot pay for their own roads and wharves, it may be presumed that such roads and wharves are not really needed. Macquarie disregarded this warning with much success, and proceeded to use the fund for any purpose that occurred to him—e.g. in 1816 he drew on it for a reward to G. W. Evans (for his discoveries west of the Blue Mountains) and for raising the salary which the colonial office had allotted to the customs officer at Hobart. In 1820 the judge-advocate, John Wylde, told Bigge that 'there is no charge which can be made or arise in the Colonial Government that has not been from time to time defrayed out of the Police Fund.' At that time the principal sources of revenue were customs duties, public-house licences, and slaughter-house dues; more than half the salaries paid to civil officials (£9824 against £8475) were paid from the fund, and when the colonial office refused to pay D'Arcy Wentworth a salary as treasurer of it, Macquarie simply authorized him to retain out of it a sum equal to £100 a year during his term of office. A similar fund established at Hobart was similarly placed under the sole control of the lieutenant-governor of Tasmania; in 1821 it paid £2006 towards official salaries as against £2897 paid by the British Treasury.

Bigge, who might have been expected to recommend the abolition of the fund, merely commented on the various purposes to which it had been put. But the establishment in 1824 of a legislative council for the colony, with power to impose duties and vote moneys for civil expenditure, certainly implied the abolition of the fund, though no formal order for it was issued.

H.A.T.T.

Polygonaceae, a large family of plants dispersed over most parts of the globe, consisting of herbs, shrubs or climbers with small petal-less flowers clustered in the leaf axils, and scarious stipules which form a sheath round the branches. The genus *Rumex*, which contains the well-known rhubarb and docks, is widely distributed. Of the four species indigenous to Australia, three are endemic, the fourth extending to New Zealand. They are perennial herbs, with jagged brown stipules and small reddish flowers; *R. crystallinus* is an inland species. *Polygonum* is chiefly composed of herbs with knotted stems and small green or white flowers; of the 13 indigenous species one (*P. articulatum*) is endemic. *P. plebium*, a widespread prostrate herb, contains about 11 per cent of tannic acid. Of the seven indigenous species of *Muehlenbeckia* five are endemic; they are undershrubs or twiners, with flowers clustered within a sheathing bract, the sepals enlarging and becoming succulent with age. *M. Cunninghami* is a divaricately-branched, spiny shrub, upon which the leaves are frequently undeveloped. It forms on the inland plains dense thickets known as Lignum scrubs. *M. adpressa* (Native Ivy) has a sub-acid, currant-like fruit which was used by the pioneers for tarts, puddings, and preserves; its leaves taste like sorrel.

Polyosma, a small genus of the family Saxifragaceae, consisting of trees; a few species extend to India and the South Pacific islands. The flowers are white or greenish; calyx 4-toothed; petals narrow and short-lived;

Feather-wood, and fruit.

fruit an ovoid berry, with a large single seed; leaves irregularly opposite. *P. Cunninghami* (Feather-wood, the 'yeralla' of the Illawarra aborigines) has fragrant tubular flowers, fluted fruits, and a pale fissile timber.

Polyprotodonts. See MARSUPIALS.

Pongamia, a genus of the family Leguminosae, is limited to one species, *P. glabra* (Indian Beech), widely diffused over tropical Asia. It is a large tree, with leaves divided into numerous leaflets; flowers in pairs; pod broad and oblique, slightly curved, thick and flat. Dr. T. L. Bancroft states that all parts of the plant contain an active emetic principle. In India an oil (Poonga oil) is extracted from the seed and used as an illuminant; it is also used to cure various cutaneous diseases.

Population, GROWTH OF. The following table shows the growth of the Australian population from 1790 onwards, in ten-year periods up to 1820 and in five-year periods subsequently.

On 26 January 1788 there were altogether 1024 persons in the settlement then founded. On 31 December of that year, a party having been despatched to Norfolk Island, the population of Port Jackson was 859. On 31 December of the years hereunder stated the population of all the Australian settlements taken together, but excluding aborigines, was as follows:—

1790	2,056	1845	279,148	1885	2,694,518
1800	5,217	1850	405,356	1890	3,151,355
1810	11,566	1855	793,260	1895	3,491,621
1820	33,543	1860	1,145,585	1900	3,765,339
1825	52,505	1865	1,390,043	1905	4,032,977
1830	70.039	1870	1,647,756	1910	4,425,083
1835	113,354	1875	1,898,223	1915	4,970,054
1840	190,408	1880	2,231,531	1920	5,411,297

At the census of 4 April 1921, the last date on which the exact population was definitely ascertained, the numbers were 5,435,734, being less than two to the square mile. The official estimate for 31 December 1925 was 5,992,084.

The three periods of marked increase are 1810-20, 1830-40, and 1850-60, in each of which decades the population almost trebled. In 1810-20 the increase was chiefly due to an abnormal influx of convicts, nearly 17,000 arriving during the period. In 1830-40 the policy of assisting immigration from the proceeds of land-sales was in full swing. In 1850-60 the discovery of gold was the dominant attraction. When the influx of would-be gold-diggers slackened, the rate of growth declined considerably. From 1858 to 1889, while immigrants were still being assisted by several colonies, the average yearly rate of increase was 3½ per cent; between 1889 and 1918 it was only 1¾ per cent, but this average includes a minimum of 1⅝ in 1902-6 and a maximum of over 2 in 1907-11. In recent years the rate has averaged just below 2 per cent.

On 31 December 1925, according to the official estimate, population was distributed among the States as follows:—New South Wales, 2,298,442; Victoria, 1,684,017; Queensland, 861,185; South Australia, 551,633; Western Australia, 372,183; Tasmania, 217,032. In the Northern Territory there were 3635 persons, and in the Federal Capital Territory 3936.

The proportion of town-dwellers to country-dwellers is of grave importance. In 1871 about 27 per cent of the population lived in the six colonial capitals, 19 per cent in smaller towns, and the remainder (54 per cent) in the country areas. By the end of 1906 the population of the six capitals had increased to 35½ per cent of the total, and by 1924 to 45½. In Victoria and South Australia the metropolitan population exceeds half the total. The occupational census of 1921 tells a similar story:—

Percentage of Bread-winners.

	1871	1881	1891	1901	1911	1921
Professional class	5.1	5.5	6.2	6.8	7.4	8.7
Domestic	11.5	12.2	11.6	12.3	10.3	9.1
Commercial	8.1	9.2	12.3	13.6	14.6	15.3
Transport	3.8	4.5	6.8	7.5	8	9
Industrial	26.5	29.5	30.7	26	28.7	31.2
Primary Producers ..	44	38.2	30.7	32.5	29.9	25.8

The almost steady decline of the primary producers is alarming, especially since it is due, not to a corresponding growth in secondary industries, but largely to the disproportionate growth of the professional and commercial classes. In 1871 17 per cent of the bread-winning population sufficed to do the business, transport, etc., for the 70 per cent who were engaged in production of some sort. In 1921 only 57 per cent were producing, and 33 per cent were carrying, trafficking, or professionally employed.

See MIGRATION. The *Official Year Book of the Commonwealth* No. 18 (1925) deals fully with recent developments and with the several factors of increase; *Year Book* No. 15 (for 1922) has a special article on censuses and on the methods of compiling estimates of population.

Porcelain Crab. See HERMIT CRABS.

Porcupine-fishes, members of the family Diodontidae, related to the well-known toadoes or puffers, which they closely resemble in both form and habits. They differ principally in the many strong spines that cover their skin and form an effective armament against enemies. Some species have short and stout spines; in others they are long and almost bristle-like; and they are provided with spreading roots, sometimes so large as to maintain the spines permanently erect. Like the toadoes, porcupine-fishes can inflate themselves with water or air—this causes the spines to stand out stiffly, and so renders them unsafe to touch. Further, their flesh is often highly poisonous, and they are therefore better left alone.

Porcupine-fishes occur in all seas, and a number of different species are recorded from Australian waters, ranging from the warm shallows of the tropics to the cold depths. A common species in Port Jackson, *Dicotylichthys punctulatus*, is white, with numerous black, round spots. Others, in the tropics, are marked with large ocelli, and still others have broad blackish bands crossing the back. A.R.McC.

Porcupine, Native. See ECHIDNA and MONOTREMES.

Porifera. See SPONGES.

Porpoises. See DOLPHINS.

Port Arthur. See CONVICTS and TASMANIA.

Port Darwin. See NORTHERN TERRITORY.

Port Essington. See NORTHERN TERRITORY.

Port Jackson. See HARBOURS and SYDNEY.

Port Jackson or Bull Head Sharks, a remarkable group of sharks of the family Heterodontidae, of which the first living representative was secured in Port Jackson and made known by Governor Phillip, after whom it was called *Heterodontus philippi*. Various allied species have since been found in other parts of the world; fossil remains of related forms, known from as far back as the Carboniferous period, indicate that the family was far more plentifully represented in Palaeozoic and Mesozoic times than at present. The teeth of the Port Jackson shark are extraordinary scroll-like structures, formed by the fusion of several adjacent teeth, and are adapted for crushing the shells of small animals upon which they feed. Two species of the family are known from Australian waters. Both deposit eggs of remarkable form; the central cavity is pear-shaped, and provided with two ribbons of a flexible horn-like material that extend in spirals round it. In one species these spirals terminate abruptly at the base, and serve to hold the egg securely when it becomes wedged in among rocks. In the other the spirals are produced into two long tendrils, which twine round marine growths and so keep the egg safely in position until the young shark hatches out. These sharks attain a length of four feet and are quite harmless to man. A.R.McC.

Port Phillip. See HARBOURS and MELBOURNE.

Portuguese Men-of-war. See BLUEBOTTLES.

Portulaca, a genus of the family Portulaceae, consisting of 14 species of succulent herbs, most of which are endemic in Australia. The cosmopolitan species *P. oleracea,* in Europe known as Purslane or Pigweed, is used as food by aborigines on the Cloncurry River in Queensland; they collect the plants in a heap which they turn over at intervals, partly to dry it, partly to let the seeds fall out from the capsules. The seeds are washed, ground in stone mills, and eaten raw, forming a highly nutritious food which, while it lasts, keeps the consumers in splendid condition. The succulent leaves are also eaten raw; their taste resembles that of watercress, and they are said to be anti-scorbutic. Of *P. napiformis* both seeds and roots are eaten. See FODDER-PLANTS.

Portulaceae, a small family of herbs, chiefly American, with a few species in South Africa and Australia. Three genera and 32 species are indigenous to Australia. *Calandrinia* has 22 species, chiefly endemic. *C. balonensis* is an inland species extending from South Australia into northern Australia; aborigines mix it with baked bark, and use it as a food. *C. polyandra* (the Coonda of the natives of Western Australia, who use it as a food), also ranges across the inland districts of the continent. Sheep are very fond of it and, while feeding on it, can subsist for a long time without water. This quality belongs to most Australian members of the family. See PORTULACA.

Posidonia. See MARINE FIBRE.

Possession Island. See EXPLORATION BY SEA.

Posts and Telegraphs. *New South Wales.*—For 23 years after the first settlement of New South Wales there were no regular post-offices in operation, and only the most imperfect means of postal communication; the bulk of the correspondence then circulating consisted of government despatches and official communications, and these were carried by constables, who were also allowed at times to carry settlers' letters. The first mention of any other form of letter-delivery occurs in the *Sydney Gazette* of 10 July 1803—regulations for the passage-boatmen between Sydney and Parramatta, which authorized a charge of 2d. each for the carriage of private letters.

On 25 April 1809 Lieutenant-governor Paterson issued the following order:

Complaints having been made to the Lieut Governor that numerous frauds had been committed by individuals repairing on board ships on their arrival at this port and personating others, by which they have obtained possession of letters and parcels to the great injury of those for whom they were intended.

The Lieut Governor, in order to prevent the practice of such frauds in future, has been pleased to establish an office at which all parcels and letters addressed to the inhabitants of this Colony are to be deposited previous to their distribution, which office shall be under the direction of Mr. Isaac Nichols, assistant to the naval officer, who has entered into security for the faithful discharge of the trust reposed in him.

The following regulations are, therefore, to be observed, viz:—

On arrival of any vessel, Mr. Nichols, or a person properly authorised by him, is to repair on board, and to require that all letters and parcels, directed for the Colony, be delivered to him, for which he is to give a receipt to the master, mate, or supercargo.

An office for their reception shall be established at his house, and in consideration of the trouble and expense attended on the duty, the following sums shall be charged by him on their delivery, viz:—

For every letter, 1s.

For every parcel not exceeding 20 lb. weight 2s. 6d., and

For all exceeding that weight, 5s.

A list to be published in the *Gazette* of the names of persons to whom letters and parcels are directed.

Soldiers' letters (agreeable to the established regulations) to be charged only one penny.

On 23 June 1810 Governor Macquarie issued a similar order in which the charges were varied, and the scope of Nichols's duties somewhat widened. Nichols's house in High-street (now George-street) under this order became a regular post-office. Nichols died in 1819; his successor, George Panton, who acted also as wharfinger, did all his work in a small office on the King's wharf.

Up to 1825 postal arrangements in the colony were not legislated for, probably because under an act passed in the reign of Queen Anne the power to 'settle' posts for the carrying and receiving of letters within British dominions was vested in the postmaster-general of the United Kingdom. In November 1825, however, Brisbane put through the legislative council an act to regulate the postage of letters in New South Wales. This act made reference to that of Queen Anne, as well as to the fact that no post had been established in New South Wales by the postmaster-general of Great Britain; affirmed the expediency, in the meantime, of providing for the temporary postage and conveyance of letters; gave power to establish post-offices in the colony and to fix rates of postage, and provided that all postage collected was to be paid to the treasury. A proclamation issued under it set out the rates of postage, the salaries and allowances of postmasters, and the regulations for their guidance, and invited tenders for the conveyance of mails between Sydney and Parramatta, Windsor and Liverpool, Liverpool and Campbelltown, and from Parramatta to Emu Plains and thence to Bathurst. In 1828 a system of general postal communication was established, and new rates of postage were fixed, depending upon distance and the difficulty of transmission—the lowest inland single rate was 3d. and the highest 1s., the postage on a letter increasing according to weight; the minimum fee was charged on weights up to a quarter of an ounce. The fee for newspapers was 1d. Letters from New South Wales to Tasmania cost 3d. each; other letters by ship cost 4d. each, single rate, and 6d. for any weight in excess. In the same year postmasters were appointed at Bathurst, Campbelltown, Liverpool, Newcastle, Penrith, and Windsor, and arrangements were made for the conveyance of mails either by contract with private individuals or by the mounted police. The Sydney staff in 1828 consisted of a chief postmaster (usually called the postmaster-general), one clerk, and one letter-carrier; there were also eight country postmasters, and a letter-carrier at Parramatta, who received as his sole remuneration a penny for every letter he delivered.

George Panton died in 1829, and was succeeded by James Raymond. In 1829-30 fairly regular services were given to the settled portions of the colony, extending approximately 120

miles south of Sydney and 238 miles west. In 1831 a regular 2d. post was inaugurated for Sydney, and unpaid 'receipt boxes' were fixed in different parts of the town and cleared twice a day. The only place at which letters could be 'post paid' was the chief post-office. Postage revenue at that time (and for many years afterwards) was collected directly in cash at the post-offices or on delivery. Stamped covers were introduced in 1838 to be sold at 1s. 3d. per dozen, and letters enclosed in them were delivered in Sydney without further charge. After 1834 mounted troopers ceased to carry letters, contracts for the conveyance of mails being substituted. In that year a post-office was established at Moreton Bay. An act of 1835 ordained fresh rates of postage, at the same time increasing the initial weight for letters from ¼ oz. to ½ oz. Inland letters were still chargeable according to distance, the minimum charge (4d.) covered 15 miles, and for 300 miles the charge was 1s., with 1d. for each additional 100 miles. In 1837 a post-office was established at Melbourne. In 1838 another act amended the rates and increased the charge on ship-letters. The following figures show the expansion between 1828 and 1838:—

	1828	1838
Revenue	£598	£8,390
Expenditure	£890	£10,357
Number of offices	8	40
Inland letters	15,598	168,551
Inland newspapers	34,832	297,245

The Sydney staff in 1838 consisted of a chief postmaster (called postmaster-general), an accountant, six clerks, six letter-carriers, and an office-keeper. In the same year a town delivery of letters in Sydney was instituted, and (on 4 December) the first overland mail was despatched to the settlement at Port Phillip. This service ran fortnightly via Liverpool, Campbelltown, Berrima, Goulburn, and Yass, at each of which places mails were made up. At the request of senders, and on prepayment of inland and sea rates, correspondence for Launceston, Hobart, and Adelaide could be sent by this route. In 1840 communication by steamer was established with Melbourne, the charge for a single letter being 1s. 3d., as by land; in the following year the first steamboat plied to Moreton Bay. In 1844 was initiated a monthly service with the United Kingdom by contract packet, the first vessel to arrive under this arrangement being the *Mary Sharp* on 11 June. An act of 1849 consolidated and amended the postal laws, abolished the privilege of 'franking' letters (which had been allowed to the principal officials), and extended the exclusive right of the post-office to carry letters and packets, making it applicable to packets weighing up to 16 oz. instead of 4 oz. as previously.

In May 1851 Raymond died and was succeeded by F. L. S. Merewether, who soon resigned to become auditor-general; Major Christie then became postmaster-general.

On 1 July 1851 all post-offices in the Port Phillip district were withdrawn from Sydney's jurisdiction. A consolidating act of 1851 authorized postmasters to refuse packets or letters which weighed more than 16 oz. or contained anything likely to injure the contents of the mails, made prepayment of postage on letters (other than those to the United Kingdom) compulsory, and allowed newspapers to go through the post free of charge if posted within seven days of publication. Prepayment of postage by stamps became obligatory from 1 May 1852, and by an act passed in December of that year maps, charts, books, and music were allowed to circulate in the colony at a reduced rate of postage. In 1854 negotiations were concluded with the British post-office for the exchange of letters at the uniform rate of 6d. per ½ oz.

In 1855 carriage of mails by railway was initiated, and glass-fronted private letter-boxes were installed in the general post-office at Sydney. At this time there were 155 post-offices in operation in New South Wales, 71 of which exchanged direct mails with Sydney. The staff numbered 223, of whom 56 were located in Sydney. In 1856 improved means of obliterating stamps were introduced, and to exercise a check on individual offices the stamp of each office was given a different number. In 1858 3,551,773 letters and packets and 2,808,140 newspapers passed through the post, the revenue for the year amounting to £39,953, and the expenditure £69,507. The number of post-offices in operation was 221.

On 10 December 1859 Queensland became a separate colony, thus reducing the length of postal lines in New South Wales by 1558 miles, and the number of post-offices by 15. In 1862 a board appointed to enquire into post-office management recommended that the position of postmaster-general be a political and independent office, and that a new general post-office be erected; consequently in 1863 the office was temporarily removed from George-street to a building in Wynyard-square. In October 1862 a money-order system was established under the control of the treasury, but was transferred to the post-office when, on the retirement of Major Christie in 1865, the position of postmaster-general was made a political and ministerial office. The first political head of the department was James A. Cunneen.

In 1867 the electric telegraph department was transferred to the control of the postmaster-general. This department had been established under the control of the minister for public works in 1857, and in 1858 Edward Charles Cracknell—who had been brought from England by Charles Todd, superintendent of telegraphs in South Australia—was appointed superintendent of telegraphs in New South Wales. He still occupied that position when the transfer to the post-office took place. A short telegraph-line (the first erected in the colony) was opened between Sydney and South Head on 26 January 1858, and in the following October the line to Albury, connecting with the Victorian line from Melbourne, was completed. The line connecting Sydney and Brisbane was opened in November 1861.

After the transfer many post- and telegraph-offices were amalgamated, and this operation was practically completed by 1870. Travelling post-offices on the railways were first established in 1870, when special vans for the carriage of mails, in charge of mail-guards, were provided on the southern line, and fitted with letter-boxes, so that letters could be posted at places along the line. In September 1871 a government savings-bank system was inaugurated under the control of the postmaster-general; by April 1872 there were 53 branches in operation, the amount to the credit of depositors being £14,226. In 1872 a penny post was established for Sydney, and was extended in the following year to the municipalities within a radius of 10 miles. On 1 September 1874 the new general post-office in Sydney was opened. In 1881 a

private telephone service was established at the Sydney stock exchange in Bridge-street, which in 1882 was taken over by the government and placed under the control of the postmaster-general. In 1893 an inland and inter-colonial parcels post was established, and the postal-note system introduced.

Although the electric telegraph department, the money-order service, and the savings-bank department had been transferred to the control of the postmaster-general, each continued to be administered as a separate entity by an officer having direct access to the minister. In 1893, however, it was decided to secure economy and efficiency in administration by incorporating these sections with the postal service in one department, under one permanent head, who would act as adviser to the minister and be responsible under him for the administration of the whole department. Stephen Harbord Lambton was made permanent head, with the designation of deputy postmaster-general, and retained that office until the transfer of the department to the Commonwealth on 1 March 1901.

Victoria.—In July 1836 John Batman, at the request of the principal settlers of Port Phillip, undertook to look after their correspondence, and may therefore be said to have been the first postmaster in Melbourne. Letters and fees were received at his house, and those for Tasmania and Sydney were entrusted by him to the masters of sailing-vessels trading with those settlements. The first officially appointed postmaster seems to have taken up duty on 13 April 1837, the only mails received and despatched at that time being conveyed by sailing-vessels between Sydney and Tasmania; but the postal service was under the control of the postmaster at Sydney till 1851. In January 1838 the overland mail first ran to Sydney. In January 1839 the first direct mail was despatched to England, by a barque named the *Thomas Laurie*. In December 1840 the *Clonmel*, the first steamer to arrive at Port Phillip with mails, reached Melbourne from Sydney. In 1841 the first government building for postal purposes was erected in Melbourne, and a town delivery of letters by carrier was commenced on 10 August. In August 1842 H. D. Kemp, an officer of experience from Sydney, was appointed postmaster, with general supervision of postal matters in the province. In 1844 receiving-boxes were erected at each end of the town, clearances taking place twice a day, except on Sunday. In 1847 mails were exchanged with Adelaide; they were sent by steamer to Geelong, thence overland to Mount Gambier, whence they were carried by South Australian troopers to Adelaide. In 1849 the number of post-offices had increased to 36; the staff in Melbourne consisted of one postmaster, five clerks, and four letter-carriers; the revenue was £6951, and the expenditure £7542.

The first Victorian postage act, passed in 1852, established rates within the colony:—not exceeding ½ oz., 2d.; above ½ oz. but not exceeding 1 oz., 4d.; thereafter 4d. per oz. or fraction thereof.

The year 1853 was one of exceptional activity owing to the stream of immigrants drawn to the colony by the gold discoveries:—

	1851	1853
Letters handled	544,425	2,038,999
Newspapers handled	450,741	1,618,789
Post-offices in operation	43	54
Staff	17	97
Revenue	£7,929	£25,733
Expenditure	£11,483	£73,040

The first electric telegraph-line in Australia was erected between Melbourne and Williamstown. S. W. McGowan, who had studied telegraphy under Professor Morse, arrived in Victoria early in 1853, with the intention of forming a private company to establish and work telegraph-lines between Melbourne, Sydney, Adelaide, Ballarat, and Sandhurst (Bendigo). He brought with him instruments, batteries, and other necessary material, but during his negotiations the government decided to take the matter into its own hands, and in September 1853 invited tenders for the construction of a line between Melbourne and Williamstown. McGowan's offer for the work was accepted, and communication between the two places was established in January 1854, though the line was not fully opened to the public until 3 March. McGowan then received the appointment of general superintendent of telegraphs.

In 1854 a new postage act increased postage rates to 2d., single rate for town letters; 6d., single rate for inland letters; and 1s. for ship letters. An act of 1855, however, reduced the rates for inland and ship letters to 4d. and 6d. respectively. Before 1857 the post-office service had been under the treasury, but in April of that year William Henry Fancourt Mitchell was appointed postmaster-general with ministerial control.

On 1 July 1858 the money-order system was introduced, and in the same year cast-iron letter-receivers were erected in Melbourne, and delivery by letter-carrier in the suburbs was made three times a day. In 1869 the post and telegraph departments were amalgamated under W. Turner as deputy postmaster-general. In 1871 the central telegraph-office was transferred from William-street to Elizabeth-street.

The post-office act of 1883 increased the initial weight for letters to 1 oz.; authorized the postmaster-general to prohibit delivery of letters to persons engaged in lotteries, race-sweeps, or other illegal occupations; vested in him the sole right of constructing, leasing, or otherwise providing for public use telegraph- and telephone-lines; and made it an offence to send through the post articles containing indecent or obscene prints, photographs, etc. The issue of postal notes was commenced in 1885. At that time there was a private telephone company in Melbourne, whose charges were alleged to be exorbitant; efforts were made to buy out the company, which asked £78,750, but accepted £40,000, and on 22 September 1887 the government took over the business. In the same year the first railway-carried mails were exchanged between Melbourne and Adelaide. Letter-cards were introduced in 1889, and the rate of postage on letters reduced from 2d. to 1d. single rate. In 1890 special trains were first used for the carriage of English mails between Adelaide and Melbourne, the cost being apportioned between Victoria, New South Wales, and Queensland on a population basis.

The following table shows the development of the postal service between 1841 and 1901:—

Year.	Post-offices.	Letters and post-cards.	Newspapers.
1841	3	56,000	120,000
1861	369	6,110,000	4,277,000
1881	1158	26,308,000	11,441,000
1901	1637	82,599,000	26,297,000

Queensland.—A post-office is said to have been opened at Brisbane in 1834, but the earliest

official record of a post-office in Queensland is that relating to the appointment of one White as postmaster at Brisbane in 1842. Offices were opened at Drayton in 1845, Ipswich in 1846, Warwick in 1848, Gayndah and Maryborough in 1849, and Nanango in 1850. By 1852 the work of the post-office at Brisbane had so increased as to necessitate individual attention, and Captain J. E. Barney was appointed in that year, a town delivery by letter-carrier being also instituted. Captain Barney died in 1855, and his widow took over his duties. In 1858 post-offices were opened at Toowoomba and Rockhampton.

Queensland was made a separate colony on 10 December 1859, and soon afterwards Robert Ramsay Mackenzie, the colonial treasurer, became acting postmaster-general. The staff in Brisbane at this time consisted of a postmistress, three clerks, two letter-carriers, and one messenger and sorter. Iron letter-receivers were erected there in 1860, in which year also the first issue of Queensland postage-stamps, printed in England from dies prepared there, was circulated.

Complaints having been made about the irregularity of the service, parliament in 1861 authorized the appointment of a non-political postmaster-general, and Thomas L. Murray-Prior was given the post on 6 November. The staff of the general post-office then consisted of a postmaster-general (also postal inspector), a postmistress, an accountant (also secretary and cashier), four clerks, two sorters, and four letter-carriers—13 in all. The revenue in the colony was £6348 and the expenditure £16,064. On 1 August 1861 a savings-bank was established in Brisbane. A branch of the general post-office was opened in Ipswich in 1862, and in the same year the money-order system came into operation.

In 1865 the government decided to abolish the position of permanent postmaster-general and appoint a responsible minister of the crown as postmaster-general, with ministerial control of the postal and electric telegraph departments—the latter had been under the colonial secretary. Murray-Prior accordingly retired, and on 1 March 1866 John Douglas assumed office as postmaster-general with ministerial status. Shortly afterwards the government of which Douglas was a member was defeated, and Murray-Prior returned to the department on 21 July 1866 as its ministerial head for seven weeks. He held the position also from August 1867 to November 1868 and from May 1870 to January 1874.

During 1866 70 steamers carrying 378 mails left Brisbane for the northern ports of Queensland, and during 1867 83 steamers carrying 483 mails. At the end of 1867 the revenue was £19,906, and the expenditure £33,444. In 1870 a permanent head of the department was appointed, with the title of under-secretary, John McDonnell being transferred to the position. The original portion (post-office) of the general postal building in Brisbane was opened in 1872. Travelling post-offices were established in January 1877 on the Brisbane-Warwick and Brisbane-Dalby railway-lines.

In 1879-80 the post and telegraph departments were amalgamated, the under-secretary being appointed permanent head of the combined department. The telegraph department had been previously in charge of a superintendent of telegraphs (J. J. Austin in 1861-3 and W. J. Cracknell in 1863-80), who occupied offices in William-street some way from the post-office. A general inspector for the Northern district, located at Bowen, had immediate control of the telegraph service in the northern part of the colony. The first telegraph-line in Queensland was erected in April 1861, connection with Sydney by wire being made in the same year. The line to Normanton and Burketown was erected in 1871, and the line to Cape York in 1887. Post-cards and postal notes were issued in 1880, in which year also a telephone service was initiated, several government departments being placed in communication with one another through an exchange to which private lines were subsequently connected. In June 1881 there were 36 instruments in circuit with the exchange.

A contract of 1881 for the conveyance of mails to Europe via Torres Straits brought about a reduction in the rates of postage from the colony to the United Kingdom. These rates had been, for letters via Brindisi 9d. per ½ oz., via Southampton 6d. per ½ oz. Under the new arrangement the charges per ½-oz. for letters were as follows:—

All the way by sea via Torres Straits	4d.
via Torres Straits and Brindisi	6d.
via Melbourne and Brindisi	9d.
via San Francisco	8d.

The first mail-steamer via Torres Straits arrived in December 1883. At the beginning of 1888 the railway-line to Sydney (with the exception of the Hawkesbury bridge) was opened for traffic, and thereafter all mails for the southern colonies were sent overland. The rate of postage on letters to the United Kingdom was reduced to 2½d. per ½ oz. in 1890, and from 1 October 1891, the date on which the Australian colonies became members of the universal postal union, that rate applied to letters to all countries which had entered the union.

In 1891 an agreement was made between the governments of Queensland and New South Wales and the Société Française des Télégraphes Sous-Marins de Paris for the laying of a cable from Queensland to New Caledonia, on a guarantee for 30 years of a subsidy of £12,000 per annum, £8000 to be paid by the French government, and £2000 each by the governments of Queensland and New South Wales. The laying of this cable was completed in 1893, the terminus in Queensland being Burnett Heads near Bundaberg. The rates charged for cablegrams between Queensland and the United Kingdom were reduced on 7 July 1897 from 9s. 5d. to 5s. 1d. per word. In 1898 an express delivery service was organized, and telephone regulations were framed to assist station-holders and others in outlying districts in obtaining telephonic communication with the nearest available telegraph-office. In 1899 John McDonnell, who had been permanent head of the department since 1870, retired, and was succeeded by Robert Townley Scott, who later became permanent head of the postmaster-general's department under the Commonwealth.

South Australia.—On the first establishment of the colony in 1836 Thomas Gilbert, the colonial storekeeper, was directed to act as postmaster, an allowance of £30 a year being made to him; mails were received, sorted, and delivered at his residence. A uniform charge of 1d. was made on all letters received and despatched, the proceeds being paid to masters of the ves-

sels conveying them. This arrangement appears to have continued until December 1838, by which time the work had so increased as to justify the appointment of Henry Watts as postmaster-general. Under the first local post-office act, passed in 1839, the rate of inland postage was fixed at 3d. per letter or packet, irrespective of weight or size; on ship-letters only 1d. was charged, to cover the gratuity to ships. In the same year a post-office was opened at Port Adelaide, with a daily mail to and from the city; an office was opened at Port Lincoln, and a fortnightly mail, carried by the police, was instituted between Adelaide, Willunga, and Encounter Bay; and in Adelaide delivery by letter-carrier was commenced.

Henry Watts resigned in 1841, and on 1 April a Captain Watts succeeded him; there were then only six post-offices in the colony, but one at Gawler was opened during the year. Under an act of 1841 inland letters were charged according to distance (maximum 2s. 6d.) and the postage on newspapers was abolished; during 1842 the inland rate of postage was imposed (in addition to the ship rate) on all ship-letters posted or delivered at country post-offices. Up to 1843 members of the council and the governor's private secretary had power to 'frank' other persons' private letters; in 1843 this extraordinary privilege was abolished, and inland postage was reduced to a uniform rate of 4d. for each ½ oz., with half-rates for letters between Adelaide and Port Adelaide and those posted for town-delivery. The inland postage on ship-letters for and from the interior was discontinued. In 1853 a private-box system was put into operation. Postage-stamps were introduced in 1855—2d. on 1 January, and 1d. and 6d. on 26 October; thenceforward prepayment of postage, by means of stamps, was compulsory. The stamps were obtained from England.

The first telegraph-line erected in the colony (from Adelaide to Port Adelaide) was opened for business in February 1856. In 1855 the government had asked the colonial office to appoint a superintendent of telegraphs; Charles Todd (q.v.) was appointed, and arrived in Adelaide in 1855, with an assistant, E. C. Cracknell. Work on the line to Port Adelaide was put in hand almost immediately. A private line erected by James Macgeorge between the same places was opened just before the completion of the government line, and was ultimately purchased by the government and dismantled. A line between Adelaide and Melbourne was commenced in April 1857, and opened for traffic on 21 July 1858.

Captain Watts retired on 30 June 1861, and was succeeded by W. J. Lewis; he held office until 1869, when the government decided to amalgamate the post and telegraph department under Charles Todd as 'postmaster-general and superintendent of telegraphs.'

Before 1848 post-office business was conducted at the private residence of the postmaster; in that year it was removed to a building afterwards known as the Gresham Hotel, from which in June 1851 it was transferred to the government buildings north of Victoria-square. On 1 November 1867 the Duke of Edinburgh laid the foundation-stone of the building at the corner of King William- and Franklin-street, which was completed and occupied in 1872; and in this (with alterations and extensions) the department is still housed.

In 1872 the transcontinental line to Darwin (2230 miles) was completed (see OVERLAND TELEGRAPH-LINE), and on 9 December 1877 the line from Adelaide to Perth was opened for traffic. The post-office act of 1876 brought post-office law and practice in South Australia into line, as far as possible, with those of the other colonies. On 8 December of that year post-cards were issued. The telephone exchange in Adelaide was opened on 14 May 1883, with 48 subscribers. An act of 1886 authorized the issue of postal notes, and another legalized the parcels-post; postal notes were issued on 1 March 1887, but the parcels-post was not established until 1889.

Western Australia.—Arrangements for handling postal matter in Western Australia seem to have been first made in 1830, when J. Purkis of Perth, and Lionel Samson of Fremantle, acted as receivers of mails at those places. An act to establish a postal department was passed by the legislative council in 1834, Charles McFaull being shortly afterwards appointed postmaster at Perth, and J. Bateman postmaster at Fremantle. An act of 1837 provided that the postmasters at Perth, Fremantle, and Albany should be independent officers, responsible only to the colonial secretary. McFaull resigned in 1840, his place being taken by E. Picking on 12 March in that year—on which date the post-office was removed to a room in the public buildings. In 1841 a weekly mail was established between York and Guildford, and a monthly one between Perth and Albany (King George's Sound). In the following year a regular mail-service was established with all the settled districts and H. Camfield succeeded Picking as postmaster-general. In 1853 A. Helmich, who had been made permanent head of the department (postmaster-general), removed the general post-office to premises in Murray-street, but it was taken back to the public buildings in 1857. In 1863 a post-office savings-bank was opened; in the same year a money-order system was established with the United Kingdom and other places outside the colony, but its extension to places within the colony did not take place until 1876.

In June 1869 a private electric telegraph-line was erected between Perth and Fremantle. This, the first in the colony, was taken over by the government in 1871. The initiation and the early and rapid extension of the government telegraph-service was due, in a great measure, to the zeal and energy of James Coates Fleming, the first superintendent of telegraphs; he retained the position until his death in 1885. By May 1877 1515 miles of line had been erected, and 23 telegraph-offices brought into communication with Perth. The total value of telegraph business for 1876 was £3780.

In 1878 the government instituted its own road-service between Albany and Perth to carry English and intercolonial mails, with a limited number of passengers and parcels; the result was satisfactory, and in January 1880 similar services were established in the south-eastern and eastern districts—all controlled by the police department in co-operation with the post-office. Halfpenny post-cards were issued in 1879. In 1887 the first telephone exchange was established at Perth, and in 1888 at Fremantle; the service was controlled by the works and railways department, and was not transferred to the post and telegraph department until 1 January 1890. The office of postmaster-general was held successively by A. Helmich (1885-7), C. F. Ga-

han (1887-9), and R. A. Shole (1889-1901). The office of postmaster-general in Western Australia, as in South Australia, was always filled by a departmental officer, never by a cabinet minister.

The cable between Roebuck Bay and Batavia was opened for traffic on 9 April 1889; it was used only for messages to and from Western Australia, except when interruptions occurred on the overland line between Adelaide and Darwin. The laying of the Cape-Australian cable connecting Perth with South Africa was completed on 30 October 1901. In 1889 the great southern railway was opened, and a travelling post-office was established between Albany and Perth. The new general post-office in St. George's-terrace was formally opened on 27 August 1890. In 1895 a travelling post-office was installed on the Midland railway, and the system was extended to other main lines as opportunity offered.

The following table indicates the development of the service between 1861 and 1901:—

Year.	Post-offices.	Letters and post-cards.	Newspapers.
1861	14	193,000	138,000
1881	52	995,000	715,000
1901	187	17,451,000	7,975,000

Tasmania.—The first Tasmanian post-office is said to have been opened at Hobart in 1809. In 1812 John Beaumont was appointed postmaster there, with permission to retain all postages collected in the colony as remuneration for his services; he was also allowed rations for himself and two servants. In 1814 he was succeeded by James Mitchell, who held office until 1822. In October 1816 it was arranged that mails should be carried by a government messenger between Hobart and Launceston; he was to leave Hobart on Sunday, walk the 120 miles, and leave Launceston on the return journey on the following Sunday. Up to that time the settlement on the Tamar had been more isolated than Hobart, since few vessels entered the Tamar River. A messenger also carried letters to Coal River and to Sorell on Pitt Water. In 1822 John Thomas Collicott succeeded Mitchell as postmaster at Hobart, and Arundel Wright was appointed postmaster at Launceston. By 1828 the Hobart-Launceston messenger had been allowed a horse, and called at Greenponds, Old Branch, Bagdad, Constitution Hill, and various inns and private houses; from Greenponds and other centres messengers on foot carried mails to Black Marsh, the Clyde, the Shannon, and places adjacent. Mails were also conveyed from Launceston to Georgetown and from Hobart to New Norfolk; mails for Sorell and Orielton went by boat; to Oyster Bay a messenger was despatched once a week, or as often as the state of the weather, river, and roads permitted. The rate was 3d. per ½-oz. letter for the first 10 miles, with a proportionate increase for longer distances.

In July 1832, the post-office having been made a government department, the clerk of the council and the acting auditor of civil accounts were constituted a committee for 'regulation of the post;' Collicott was made principal postmaster and given the services of a clerk. There were then 25 post-offices in operation and 36 messengers were employed at 'post stations' for the receipt and delivery of letters. In May 1833 the committee was dissolved, and a 'director-general of the post-office department' (Captain James England) appointed; at this time mails were carried between Hobart and Launceston twice a week by a one-horse mail-cart. A postal act of 1834 appointed Collicott postmaster-general, and established a general post-office in Hobart and branch post-offices throughout the territory; postage on letters not exceeding 4 oz. in weight, posted in Hobart or Launceston for delivery in the same town, was fixed at 2d.; if intended for delivery at a distance of 2-15 miles, 3d.; 15-30 miles, 4d.; 30-45 miles, 5d.; and so on in proportion. Letters carried by sea cost 4d. per single letter in addition to the inland rate; and newspapers directed to persons more than 60 miles away were charged 1d. each—if under 60 miles, ½d. In 1835 messengers at branch post-offices were withdrawn on account of the expense, but were afterwards replaced by prisoners holding tickets of leave, who worked on a promise of emancipation for continued good conduct. The general post-office at Hobart, which had been situated in Murray-street, was removed in 1836 to the corner of Collins- and Elizabeth-street. Collicott died in 1840, when Captain F. C. Smith was appointed, and held the office till 1858.

By an act of 1842 a uniform rate of postage according to weight, irrespective of distance, was introduced; ½-oz. letters delivered beyond Hobart and Launceston were charged 4d., those posted and delivered within Hobart and Launceston 2d., and those for places oversea 4d. The postage on newspapers was abolished in September of the same year. A money-order system was inaugurated on 25 September 1852. An act of 1853 made prepayment by stamps compulsory, and reduced the rate for town letters from 2d. to 1d. An act of 1858 established a 'suburban' rate of 2d., applicable within five miles of the Hobart and Launceston post-offices. In 1858 the position of postmaster-general was abolished, and the permanent head of the department (Stephen Tunbridge Hardinge) was called secretary to the post-office.

The first electric telegraph-line was erected between Hobart and Launceston in 1857, and on its completion W. H. Butcher was appointed superintendent of telegraphs under the control of the public works department. A cable between Tasmania and the mainland was laid in 1859, but had a life of a few weeks only; it was not until 1869, when a second cable had been laid, that the colony was permanently connected with the telegraph-systems of the other colonies. Another cable was completed in February 1909 at a cost of £49,455. Telephone exchanges at Hobart and Launceston were opened in 1883, and at New Norfolk in 1888. The post-office act of 1881 fixed the rate for town letters at 1d. and for inland letters at 2d. A government savings-bank was instituted in 1882, and the amalgamation of the post and telegraph departments was effected in 1894.

Oversea Mail-services.—In 1844 the first monthly-contract sailing-packets reached Melbourne from the United Kingdom, and until 1852 oversea mails to and from Australia were carried by transports and other sailing-vessels; in that year the Peninsular and Oriental Company's steamer *Chusan* arrived in Sydney on 3 August via the Cape of Good Hope, followed later in the year by the Royal Mail Steam Navigation Company's steamer *Australian*, under a contract made by the British government for the conveyance of mails every alternate month. The service was, however, not satisfactory, and in 1853 a contract was entered into with the Peninsular and Oriental Company for a service

every alternate month from Singapore to Sydney, via King George's Sound, Adelaide, and Melbourne. The *Shanghai*, the first vessel to arrive under this contract, reached Adelaide on 14 May 1853. In 1857 the British government contracted for a monthly service between Southampton and Sydney, and in 1859 for a monthly service via the Mauritius; in 1860 Point de Galle in Ceylon was substituted for the Mauritius. This contract remained in operation until 1873. In 1866-8 a line of steam-packets ran from Sydney to Panama via Wellington, and in 1869 a monthly service from Sydney to San Francisco via Auckland was inaugurated. The last of the San Francisco contracts expired in 1906, since which date Australian mails have been carried by that route on a poundage basis. In 1873 Victoria contracted for a service to Point de Galle, New South Wales for a service to San Francisco, and Queensland for a service to Singapore. Contracts were also made by the Queensland government in 1881 and subsequent years for the conveyance of mails to the United Kingdom via Torres Straits and Suez; but the principal mails between Australia and Europe have been carried by the Peninsular and Oriental and Orient companies, via Suez.

Oversea Cables.—The cables connecting Australia with places oversea are:—

Darwin-Banjuwangi (Java). Completed in 1871.
Sydney-New Zealand (Eastern Extension Company). Completed in 1876.
Darwin-Banjuwangi (duplicate). Completed in 1879.
Sydney-New Zealand (duplicate). Completed in 1890.
Burnett Heads (Queensland)-New Caledonia. Completed in 1893.
Fremantle-Durban, via Cocos. Completed in 1901.
Southport (Queensland)-Vancouver Island (Canada). Completed in 1902.
Sydney-New Zealand (Pacific Cable Board). Completed in 1912.

International Postal Congresses.—In 1897 the Australian colonies and New Zealand (represented by John Gavan Duffy, postmaster-general of Victoria, and James Smibert as *fonctionnaire attaché*) took part at Washington for the first time in a congress of the Universal Postal Union, to which they had been admitted in accordance with a decision of the previous congress held at Vienna in 1891. Subsequent congresses were held as follows:—

1906 Rome—
Austin Chapman, postmaster-general
Justinian Oxenham, *fonctionnaire attaché*
1920 Madrid—
Justinian Oxenham, secretary of the postmaster-general's department
James Kay, *fonctionnaire attaché*
1924 Stockholm—
W. G. Gibson, postmaster-general
James Kay, *fonctionnaire attaché.*

Intercolonial Postal Conferences, to deal with oversea mail arrangements, oversea cables, and general postal and telegraphic matters affecting the Australian colonies, were held in 1867, 1877, 1878, 1883, 1888, 1889, 1890, 1891, 1892 (2), 1893, 1894, 1896, and 1898; at the first of the two conferences held in 1892 a draft Australian postal convention was adopted. At some of these conferences New Zealand was represented.

Commonwealth.—The proclamation constituting the Commonwealth of Australia as from 1 January 1901 having been issued on 17 September 1900, the permanent heads of the State post and telegraph departments met in Sydney in November-December of that year to draft a Commonwealth consolidating post and telegraph bill, and to suggest other arrangements for the working of the department under federation. The Commonwealth post and telegraph act of 1901 practically embodied their principal recommendations, and provided for the management of the department by a postmaster-general (a responsible minister with cabinet rank), a permanent secretary with chief control under the minister, and a deputy-postmaster-general in each State.

Sir John Forrest, the first postmaster-general appointed, did not take over the duties, his term of office extending only from 1 to 17 January 1901; J. G. Drake succeeded him on 5 February. On 1 March 1901 the department was transferred by proclamation to the Commonwealth, but the State departments continued to function under State law, pending the passing of a federal post and telegraph act. No steps were taken to appoint administrative staffs to the various Commonwealth departments, but Justinian Oxenham (private secretary to the postmaster-general) acted as official secretary to the postal department until June 1901, when the central administration was constituted with Robert T. Scott as secretary and permanent head. In December 1901 the Commonwealth post and telegraph act came into operation, but State rates, charges, and regulations remained in operation until revoked. Commonwealth regulations came into force on 30 June 1902; uniformity as regarded rates charged for the conveyance of newspapers and the transmission of telegrams was secured by a rates act which took effect from 1 November 1902; but State charges for letters, post-cards, and packets remained unaltered until 1 May 1911, when the rates act of 1910 came into operation. This act inaugurated penny-postage throughout the Commonwealth for ½-oz. letters. Victoria had had penny-postage for years within its own borders, but in other States the rate had been 2d. per ½-oz. letter, except within certain town limits. Owing to the book-keeping provisions of the constitution act (which operated for a period of ten years after federation) each State had to continue using its own postage-stamps, which were not available for the prepayment of postage in another State. The need for continuing this arrangement disappeared in 1910, and from October of that year stamps of any State might be used to prepay postage in any part of the Commonwealth. The issue of a Commonwealth stamp followed soon afterwards (see PHILATELY).

In 1905 a wireless telegraphy act was passed, and tenders were accepted in 1910 for the erection of two high-power stations, one near Sydney, and the other near Fremantle; but it was not until after 1911, when an engineer for wireless telegraphy (J. G. Balsillie) was obtained from England, that that section of the department was organized for general service round the coast of Australia (see RADIO-TELEGRAPHY). In 1907 a conference with the railway departments of the States resulted in an agreement for a uniform charge for the conveyance of mails by rail.

Sir Robert Scott retired from the position of secretary on 31 December 1910, after 47 years' service; Justinian Oxenham succeeded him on 1 January 1911, and was himself succeeded on 17 December 1923 by H. P. Brown—an officer with distinguished service in the British post-office, who had been lent to the department in an advisory capacity for 12 months.

The expansion of the department since federation is indicated by the following figures:—

Year.	Offices in operation.	Letters and post-cards.	Newspapers.	Revenue.	Expenditure.
				£	£
1901–2	4,994	238,000,000	116,000,000	2,372,861	2,478,796 (gross).
1924–5	10,020	692,043,000	173,148,000	10,074,854	9,2[illegible]0,629 (working).

The amount spent on new works in 1903-4 was £37,149; in 1924-5 the capital expenditure on fixed assets and plant was £5,450,681.

See OVERLAND TELEGRAPH-LINE, PACIFIC CABLE, PHILATELY, and SAVINGS BANKS. J.O.

Potamogetonaceae, a family of aquatic plants, marine or fluvial, with six genera indigenous to Australia. *Posidonia* has one endemic species, and one found in the Mediterranean and on the European shores of the Atlantic; both are submerged maritime plants, covering large areas in shallow water along the coasts. *P. australis* (Sea-grass or Sea-wrack) extends from Western Australia to New South Wales, and is very plentiful in Spencer and St. Vincent gulfs, where it has been exploited on a commercial scale for some years. It is rolled up into felted balls by the action of the waves, and thrown up on the beach in great quantities. The fibre manufactured from it has been used in paper-making, and for weaving into a coarse cloth, as well as for carpet-making (see MARINE FIBRE). *Ruppia* is limited to a single species, *R. maritima* (Sea Tassel), a slender herb with thread-like branches that forms a tangled network in brackish lagoons in most temperate and subtropical regions.

Potatoes. In 1798 Hunter reported that out of a cultivated area of about 6200 acres 14 were laid down in potatoes, and Bligh in 1807, writing 'The Gardens are now giving Supplies of Potatoes,' explained that this was due to his having 'demanded personally the exertions of everyone to this culture.' It is evident, therefore, that (as might be expected from more recent experience) potatoes did not grow easily in the comparatively poor soil of the Sydney district. The colonial office, however, could not be brought to believe this, and at the end of 1807 Bligh was rebuked for leaving the crop out of his calculations—in London they knew that potatoes were 'a certain crop in the colony.' Under Macquarie in 1811 potatoes accounted for 123 acres out of 5278 cultivated, and in 1821 (when the spread of settlement west of the Blue Mountains was beginning to show results) 737 acres out of 32,269; in Tasmania the proportion was lower—14 acres out of 871 in 1811, and 95 out of 10,050 in 1820. By 1828, however, the special suitability of the Tasmanian soil had been discovered, and Darling told the colonial office that New South Wales grew potatoes 'chiefly for the Table and of an excellent quality, but little inferior to those of Van Diemen's Land and New Zealand, whence, particularly from the former, considerable quantities are imported.' In 1834 the Tasmanian potato crop was 7114 tons, grown on 2495 acres out of a total of 69,217 cultivated. During the 1840s two new centres of potato-growing were opened up—the Pambula district on the south coast of New South Wales, and the since famous Warrnambool district in western Victoria.

At the present time the potato is cultivated chiefly in Victoria, Tasmania, and New South Wales where under suitable conditions of soil and climate it reaches a high state of perfection. Only in the two southern States does supply exceed demand; they, however, supply the needs of the other States, and only in years of exceptional drought is it necessary to import New Zealand potatoes.

Victoria generally produces more than half the total Commonwealth crop. The rich volcanic soils of the Portland Bay and Warrnambool districts are especially famed for their productiveness. In proportion to population, however, Tasmania has by far the greatest yield, especially in the north-west, where is grown the well-known 'Circular Head' crop. The Brown's River and Huon River districts have also produced large quantities for many years. The average production per head of population in Tasmania for the past five seasons is 7.5 cwt. as against 2.6 cwt. for Victoria. In New South Wales excellent crops are grown (*a*) round Guyra, Armidale, and Orange on the high tablelands, where there is a considerable area of volcanic soil and a good rainfall, and (*b*) in the rich alluvial soils of the Hunter and Clarence river districts; but the Orange district produces one-third of the total yield. The high cost of railway carriage to the central markets, compared with the cheaper water transport from Victoria and Tasmania, is a handicap to the New South Wales industry. In South Australia potato-growing shows a marked progress, the average for the past ten seasons being 3.47 tons per acre. In recent years the dreaded 'Irish blight' has made its appearance, but vigorous measures for its suppression have succeeded to a considerable extent. The area under potatoes, yield and value for 1924-5 was as follows:—

	Area (acres)	Yield (tons)	Value (£)
New South Wales ..	23,044	49,485	419,310
Victoria	61,196	169,863	910,733
Tasmania	32,109	82,094	608,652
Other States	16,691	44,649	496,394
Commonwealth	133,040	346,091	2,435,089

The Native Potato (*Gastrodia sesamoides*), which is really an orchid, is indigenous to all the States except South Australia; it is also known as 'potato orchid' and 'black man's potato.' Its tubers are of the size, and almost of the shape, of kidney potatoes, and are attached by thick fleshy fibres to the root of some tree on which the orchid is parasitic. The Tasmanian aborigines roasted them for food—their taste resembles that of beetroot. W.S.C.

Pottinger, SIR FREDERICK WILLIAM (1831-1865), born in India on 27 April 1831, was the second son of Lieutenant-General Sir Henry Pottinger, a distinguished public servant who was political resident in Cutch (1835-40), British envoy to China (1841-2), first governor of Hong Kong (1843-4), governor of The Cape Colony (1846), and governor of Madras (1847-54), and in April 1840 was made a baronet for his services in India. Frederick about 1856 migrated to New South Wales, and in that year succeeded to his father's title. He secured employment in the police force, just then beginning its long warfare against the bushrangers of the gold-rush period, and in 1862 was inspector in charge of the Lachlan goldfield.

He thus came into close contact with the gang led at first by Frank Gardiner (q.v.) and afterwards by Ben Hall (q.v.), and had little success against either leader. His repeated failures to arrest Gardiner, even when he had him at arm's length with eight police in the neighbourhood, and his avowed belief that Gardiner had nothing to do with the Eugowra escort robbery (see BUSHRANGING), raised much ill-feeling in Sydney and made him the subject of many jeers and suspicions. Ben Hall he certainly did his best to capture—indeed, it was probably Pottinger's arrest of Hall in June 1862, before he had joined any gang, that drove him into Gardiner's arms. For two years Pottinger strove to keep the Lachlan roads safe for traffic and incidentally to hunt down the gang, and by the middle of 1864 was so hampering Hall's movements as to force him southwards into the Goulburn-Gundagai district. In January 1865, however, it was reported that Hall and a friend had been spectators at the Wowingragong racecourse (near Forbes) while Pottinger took part in a race there; the report was probably false, as Hall was then operating near Goulburn, but in March Pottinger was recalled to Sydney to explain the matter. On his way there his pistol exploded accidentally, giving him a fatal wound, and he died on 9 April.

Pouched Mice, a name generally applied to a group of small marsupials which, though mouse-like in size and to some extent in general appearance, have in reality little in common with the true mice (Rodentia) or harvest mice (Insectivora). The pouched mice are members of the family Dasyuridae, which includes also the native cats (q.v.). Pouched mice belong to five genera—*Phascogale, Chaetocercus, Sminthopsis, Antechinomys,* and *Dasyuroides*—and altogether some 22 species have been described from Australia and Tasmania. One of the best-known of the smaller kinds is the Common Pouched Mouse (*Sminthopsis murina*), a slender, mouse-like animal whose head and body together are about 3½ inches long, and tail about the same; its fur is soft, fine, and gray, and its ears of variable size. Its hinder parts are of slaty flesh-colour, its hands and feet white, and the slender tail is covered uniformly with short hair. It occurs over the whole Australian mainland outside the tropics, as does the comparatively large, grayish, Brush-tailed Pouched Mouse (*Phascogale penicillata*), a sub-species of which (*P. p. pirata*) occurs in Arnhem Land in the Northern Territory. The Lesser Brush-tailed Pouched Mouse (*P. calura*) is similar to *penicillata,* but is considerably smaller and of a more brownish general coloration; it is also more rare, and has been recorded from south-western and south Australia, as far north as Alice Springs, but it is not possible to define its present range. The Pigmy Pouched Mouse (*P. minutissima*)—which is only 5½in. in length including the tail—is only found in central and southern Queensland; the Little Pouched Mouse (*P. minima*) is confined to Tasmania and the neighbouring islands; Swainson's Pouched Mouse (*P. swainsoni*), occurring in Tasmania as well as Victoria and New South Wales, is a medium-sized strongly-built species of a sombre, grizzled, dark brown colour. The Yellow-footed Pouched Mouse (*P. flavipes*) ranges from Papua to South Australia. The Long-tailed Pouched Mouse (*P. longicaudata*) is an inhabitant of the Aru Islands.

Some pouched mice are arboreal, and make nests among branches, or in hollows in the trunk or limbs of trees. Others live in burrows, and some in holes among rocks, and under stones. In general their diet is of an animal nature, and consists largely of insects.

The 'Jerboa' Pouched Mouse (*Antechinomys laniger*), which is an inhabitant of the far interior of New South Wales and southern Queensland, gets its name from its long kangaroo-like feet, long brushy tail, and habit of locomotion by a series of leaps or hops. A second species (*A. spenceri*) has been described from Charlotte Waters, and it doubtless inhabits central and northern South Australia. Both species are very rare. The so-called long-snouted pouched or honey-mouse (q.v.) is a phalanger. See MARSUPIALS.

W.A.H.

Praed, ROSA CAROLINE, born in southern Queensland on 27 March 1851, in 1872 married Arthur Campbell Mackworth Praed, nephew of the poet W. M. Praed. In 1876 she migrated to London and soon afterwards began a series of Australian novels, the first (*An Australian Heroine*) appearing in 1880. She also collaborated with Justin McCarthy in a series of novels dealing mainly with British political life. At the time of publication her Australian work was considered brilliant and life-like, reproducing as it did scenes of Queensland life in Brisbane and on stations which she knew well; but with the changes in Australian politics, and the advent of more broadly representative Australian fiction-writers, her novels are neglected.

Pratincoles. See WADERS.

Pratt, SIR THOMAS SIMSON (1797-1879), born in 1797 and educated at the university of St. Andrews, joined the army in 1814 (ensign, 1814; captain, 1825; lieutenant-colonel, 1841; colonel, 1862; major-general, 1873; lieutenant-general, 1878). He served in the Netherlands in 1814-5 and in China in 1841. In 1856 he was appointed to command the British forces in Australia (with the local rank of major-general), and conducted a campaign against the Maoris in 1860-1; on his return to Australia he took command of the forces in Victoria. He left Australia in 1862, retired from active service in 1877, and died in England on 2 February 1879. (C.B., 1841; K.C.B., 1861.)

Prawn-killer. See CRAYFISHES.

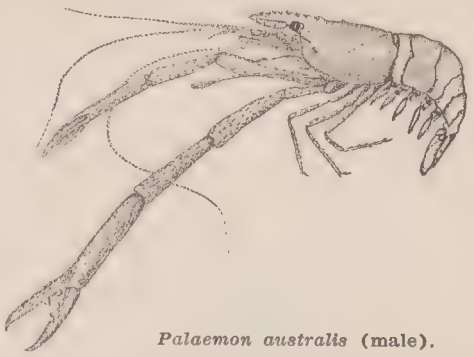
Prawns and Shrimps, marine or freshwater crustaceans belonging to three tribes of the sub-order Macrura, order Decapoda; three other tribes of the sub-order contain the crayfishes. They are generally distinguished by the great size of the abdomen, which is symmetrical and not folded under the body but carried more or less extended rearwards. The last pair of abdominal appendages (uropods), which are often wanting in the other groups, are always present in the Macrura, and are generally broad and flattened, forming, with the median-placed telson, a 'tail-fan.' Members of the first tribe (Peneidea) are characterized by the possession of certain structural features that distinguish them from a great number of superficially similar forms which are commonly confused with them by the casual observer; the first three pairs of legs are usually chelate (i.e. bear small pincers at their tips), and the side-plates of the second abdominal segment (somite) do not overlap those of the first. The common commercial prawns

of Australia are representatives of the Peneidea, and fall into the typical family Peneidae.

Australian prawns provide an industry of considerable economic value. They are secured by netters in shallow bays and estuaries of the more populous parts of the Commonwealth, and are generally plentiful between the months of October and March. Very little is known of their migrations beyond the fact that they occasionally appear in large numbers, and then almost completely disappear again. The three common species are the School Prawn (*Penaeopsis macleayi*), the King Prawn (*Peneus plebejus*), and the Tiger Prawn (*P. esculentus*). The school prawn, the smallest of the three, is in great demand as bait for fishermen. When alive, it is semi-transparent and covered with small reddish spots. The mottled colours of the king are distinctly pleasing; blue predominates; the swimmerets and tail are prettily marked. This species commonly attains a length of six inches, and, on account of its uniform size, is in greatest demand for consumption. The largest of the three is the handsome tiger prawn, readily recognized by the brown, tiger-like stripes that extend across its sides; specimens 12 inches in length have been recorded from Port Jackson. Egg-bearing or 'berried' females of the tribe Peneidea have never been observed, and it is now practically accepted that the ova are cast adrift singly in the water. From the scant data to hand regarding the larval stages of these crustaceans, it seems that they quit the egg at a very much earlier stage than do any of the other higher forms. The earliest known stage was discovered by Fritz Müller in 1864, and proved to possess a structure like that of the larval nauplius form so frequent among the groups of smaller Crustacea.

Peneus plebejus.

In the tribe Eucyphidea the first two pairs of legs are generally pincer-like (chelate), and the first is seldom larger than the second. The second segment of the abdomen has the side-plates broadened so as to overlap those of the segments in front and behind. Only about nine of the numerous families composing this tribe are represented in Australia. Members of the families Palaemonidae, Atyidae, and Alpheidae are most popularly known. The first has a world-wide distribution, and includes the long-armed prawns, found in both salt and fresh water. In these the second pair of limbs are greatly enlarged, their several joints being lengthened and thickened so as to appear unwieldy. A common estuarine species is *Palaemon novae-hollandiae*, which is often netted along with the commoner commercial prawns. Some of the inland rivers are inhabited by an allied form, *Palaemon australis*. The Australian members of the family are comparatively small, but species of *Palaemon* from the Pacific islands grow to a foot or more in length, and their large claws may be as long again. Several species of another genus (*Leander*) occur in rock-pools on many parts of the coast. *Leander serenus*, common round Sydney, is brilliantly adorned with reddish stripes running longitudinally on the front part of the body; flecks of the same colour are arranged similarly along the back and sides of the abdomen. The rest of the body is transparent, except for the long pincer-bearing arms, each of which has a dark-red band distally, followed by smaller proximal dots of the same colour. From the freshwater family Atyidae only one representative of the typical genus has been recognized in Australia; this is *Atya striolata*, a beautiful green-striped and mottled shrimp that occurs in the rapids of some mountain streams on the southern half of our eastern seaboard. A commoner form is the small *Paratya australiensis*, a species widely distributed through the interlacing river-systems of the eastern and southern portions of the continent. As in other parts of the world, the distribution of the Atyidae presents many difficult problems; closely allied species are found to occur in the fresh waters of New South Wales, Norfolk and Lord Howe islands, New Caledonia, and New Zealand—in one instance a small species occurs both on the mainland and on a small island hundreds of miles away. Members of the Atyidae have the two pairs of pincer-claws feeble, the fingers being tipped with brushes of long hairs, which are used in sweeping up minute particles of food from the mud. In the family Alpheidae we have typically the nipper or hooded prawns, which have the two nippers of the first pair of legs greatly enlarged and very dissimilar in shape. The fingers of either the right or the left nipper bear long hairs on their inner surfaces, as in the Atyidae, whereas the larger nipper of the other side has the fingers heavily armed with strong distal teeth, one overlapping the other in the form of a curved beak-like point. The likeness to a hood apparent in the structure of the larger nipper has earned for these prawns one of their common names. With the aid of this nipper they can produce a peculiar clicking noise, a common sound on the mud-flats where many abound. At night-time a few specimens are secured near their habitat along with, and during the season for, the commercial prawns. The Alpheidae are represented by many species in Australian waters, some of which occur abundantly in tropical regions, especially on coral-reefs. The typical genus *Alpheus* includes one species (*A. edwardsi*) which has a wide range on the coast.



Palaemon australis (male).

The small tribe of the Stenopidea includes a few forms that resemble the Peneidea and the crayfishes in having the first three pairs of legs

chelate; but they differ in having the third pair of legs much larger than the others, and in other characters of body-structure. The single family Stenopidae has a brilliant representative on the

Stenopus hispidus.

tropical coasts—*Stenopus hispidus*, which is unique in its distribution, since it is recorded from both the Atlantic and Pacific oceans. In life this creature is strikingly coloured with broad scarlet bands on a porcelain-white and bluish ground.

F.A.McN.

Premna, a large genus of the family Verbenaceae, consisting of shrubs or trees with opposite leaves, widely distributed. The calyx is truncate; corolla-tube short, with 3 or 4 (rarely 5) lobes; stamens 4, enclosed in the corolla-tube; fruit a small succulent drupe, with a 4-celled, undivided kernel. *P. obtusifolia* (the Ngaeki of the Tully River natives) has a brownish timber.

Presbyterian Church. The first free Presbyterian settlers in Australia were emigrants from the Scottish borders, who settled near Portland Head on the Hawkesbury River in 1802, James Mein, an elder from London, acting as catechist. Governor Bligh mentions him as the only minister who was not an official chaplain. He conducted services in private houses or the open air, until in 1809-10 the settlers put up a substantial stone building (the Ebenezer church) which cost over £400, and was the first church built by voluntary contributions in Australia. It was enlarged in 1817, and is still used for public worship. Its first settled minister was John Cleland (1831-9).

The first Presbyterian minister to settle in Australia was John Dunmore Lang (q.v.), who arrived in May 1823, preached his first sermon on 8 June, and in the following year held in the Ebenezer church the first Presbyterian communion service in the colony. In 1832 the first presbytery was formed, consisting of Dr. Lang, John Gregor (Maitland), John Cleland, and K. D. Smythe (Bathurst). In 1834-5 Lang built the Australian College near the Scots church, Sydney, at a cost of £12,000—but the undertaking lost money, and closed in 1854. In 1837, while he was away in Britain securing recruits for the Australian ministry, the presbytery of New South Wales had a temporalities act passed by parliament to regulate its temporal affairs. On his return he objected to this act as against the spirit of a young and independent country; so on 11 December 1837 he and a number of ministers whom he had just brought out separated from the presbytery and formed themselves into the 'Synod of New South Wales' with no appeal beyond the colony. This synod consisted of three presbyteries, Sydney, Windsor, and Hunter River. Within two years, however, the Church was again united (5 October 1840) under the title of the 'Synod of Australia in connection with the Established Church of Scotland,' and an amended act was passed on 7 October 1840. The united Church did not enjoy unruffled calm for long. In 1841 Dr. Lang visited the other colonies, and the presbytery saw fit to admonish him for being absent too long from his congregation. Resenting this strongly, he on 6 February 1842 delivered a sermon in Scots church in favour of voluntary as against state aid for religion, and intimated his intention of resigning the pastorate and going to New Zealand. From this he was dissuaded by friends, and consented to remain on condition that the congregation severed itself from the Synod of Australia and refused to take state aid. The synod on 7 April 1842 summoned him on the charges of slander, schism, and contumacy, and finally deposed him from the ministry; it also asked the presbytery of Irvine (Scotland), by whom he had been ordained, to confirm their action, and that presbytery did so. Dr. Lang immediately began a process at law against the presbytery of Irvine, appealing to the privy council, with the result that the deposition was rescinded, first in Scotland, and afterwards in 1863 by the Synod of Australia. Meanwhile a portion of his congregation seceded and formed a new Presbyterian Church (the fourth) in Sydney.

After the disruption of the Church of Scotland in 1843, the Churches in Australia sought to avoid taking sides, as they needed help from all parties in Scotland; the issue, however, was forced on them, and in October 1845 it was resolved to remain in sympathy with both the Established and Free Churches in Scotland, and also to drop from the name of the Australian Church the words 'in connection with the Established Church of Scotland.' Next year this resolution was rescinded, and the former title adhered to, the result being the withdrawal of William McIntyre, John Tait, and Colin Stewart, who formed the Synod of Eastern Australia in sympathy with the Free Church of Scotland. This lasted till 1864, and brought out some of the most celebrated ministers who have served the Church in New South Wales—in 1853 William Grant, Archibald Cameron, and James Cameron, in 1858 John Kinross, in 1860 James S. Laing and A. C. Geikie; and Robert Steel in 1862.

On 3 April 1850 the Synod of New South Wales was constituted, Dr. Lang being the moving spirit. In 1854 a small but vigorous congregation connected with the United Presbyterian Church of Scotland established itself in Sydney, and built St. Stephen's church in Phillip-street; Hugh Darling ministered there in 1856, and was succeeded in 1861 by Adam Thomson. But the union of the Presbyterian Churches in Australia had been set in motion in 1854 by the Synod of Australia, which conferred with

the Synod of Eastern Australia to that end. Little, however, was accomplished till 1862, when negotiations were renewed, the scope being enlarged to admit Presbyterian ministers and office-bearers not hitherto included. On 15 November 1864 the synods of New South Wales and Eastern Australia united under the name of 'The General Synod of the Presbyterian Church in New South Wales,' Dr. Geikie being elected moderator, and Dr. James Cameron clerk; Drs. Steel, Laing, and Kinross took leading parts in effecting the union. Overtures were then made to the Synod of Australia and to the United Presbyterian section worshipping in Phillip-street. A Basis of Union was drawn up, the various bodies were formally dissolved, and the first general assembly of the Presbyterian Church of New South Wales was inaugurated with Adam Thomson as moderator, and J. B. Laughton as clerk. One of its first tasks was the re-arrangement of the presbyteries and the organization of the whole Church. A fund for bringing out ministers from Great Britain was collected, and honorary agents were appointed there to select suitable men. It was soon found that a special man was required for the organization of the United Church, and J. Miller Ross, who had been for seven years agent for the Presbyterian Church of England, accepted an appointment for three years as agent of the New South Wales Church. Ross prepared a sustentation fund scheme, organized the Church offices, and systematized various activities. He died in 1893, and was succeeded by William Wood.

As population in the other colonies increased, Presbyterian ministers went to them from New South Wales and elsewhere, and separate assemblies sprang up to control affairs in each colony. In process of time, however, men found it essential to bring together these branches of the one Church; conferences were held, and a federal Basis of Union drawn up, the autonomy of each Church being strictly preserved. The first federal assembly, held in Sydney in 1886, was presided over by J. Nish of Bendigo, who had done much for its consummation. Good results came of federation, but something more in the way of union was needed, as the federal assembly had little if any authority over the other Church courts. It was therefore decided to arrange for the unification of all the Churches under one general assembly, possessed of legislative, judicial, and administrative functions. A new Basis was prepared, still allowing for the control by the several Churches of their property and vested funds and their home missions. The last meeting of the federal assembly took place in Sydney on 23 July 1901; the moderators of the five States read authorities from their respective assemblies to sign the Deed of Union; and next day the first General Assembly of the Presbyterian Church of Australia was constituted, John Meiklejohn of Melbourne being unanimously elected moderator, and James Laing of New South Wales clerk. This general assembly, which meets biennially in one or other of the State capitals, has among its functions the admission of applicants for the ministry, and the control of the inland mission, board of aborigines' missions, theological halls, and other departments of the Church's work. The chief problem it has yet to solve is that of union with the Methodist and Congregational Churches in Australia; the members of the interested Churches have already given a majority vote in favour, but the majority vote of the Presbyterian Church is not deemed large enough (60 to 40) to warrant immediate union.

A big undertaking of the United Church is the inland mission, which was started in 1910, and embraces nearly two-thirds of the continent. It comprises six stations with 14 nurses in the field and seven nursing-homes, ministering to some 80,000 people living in the most sparsely-populated regions of the interior. See MISSIONS.

NEW SOUTH WALES.—Much of the history relating to this State has been already covered, since in the early years New South Wales was Australia. In connection with the recent history of the Church in the mother-colony should be noted the conveners of the home mission committee, notably James Cameron (20 years), John Auld (10), and T. E. Clouston (1904-15). In 1915 Thomas Morgan was appointed convener, and superintendent in 1916. He had been minister at Bourke for 12 years with a district of 300 square miles, and has achieved much for the home mission department. A director of home mission studies has also been appointed. Laymen have been generous with their wealth, Robert Logan bequeathing £25,000, J. H. Goodlet £38,000, and Alexander Berry £30,000 to sustentation and other funds. In addition, funds were raised to bring out ministers from Great Britain. The aged and infirm ministers' fund and the widows and orphans of ministers' fund originated in the assembly of 1866; the latter scheme was adopted in 1869, the former in 1876; by it, in addition to the proceeds of collections from congregations and gifts and bequests from individuals, each minister pays £5 per annum, and receives on retiring at least £120 per annum. In 1921, mainly through the energy of William Wood, the two funds were combined, and the allowances to beneficiaries increased.

The property of the Church was safeguarded first by the temporalities act of 1881, and afterwards by the consolidation act of 1904, and vested in seven trustees. A law agent and a procurator are also appointed to advise the assembly and trustees in matters of legislation. In 1885 a majority fund was organized to celebrate the 21st year of the United Church, and donations totalling £26,310 were received, of which nearly £4000 was contributed by the ministers. A centenary fund was established in 1899, by which £52,000 was collected from 10,032 subscribers. Donations could be allocated to the erection of churches, manses, or schools up to 80 per cent of the total cost. Part of the fund was also used to publish the *Centenary History of the Presbyterian Church in New South Wales*, for which task James Cameron and (later) John Walker were appointed by the assembly. Another fund which has been of great help in many ways is the bequest of Sir Samuel McCaughey, which brings in an annual income of over £5100. The treasurership committee has the control of over £360,000. One of the latest societies in the Church is the Men's League, with branches in many congregations, whose special work is to supplement the religious instruction given by ministers in state schools.

Education.—In 1883 the Sabbath schools were reorganized, annual examinations instituted, and schemes of lessons adopted. In 1921 N. H. Joughin was appointed director, and established a bush Sunday-school by which, through the post-office, some 500 children in isolated districts were provided weekly with Bible instruction. The Fellowship Union was begun by Dr.

John Moon in St. Stephen's congregation in 1876.

In 1867 the colonial government offered to various denominations sites adjoining the university (which is purely secular) for building colleges, with a £ for £ subsidy for the building and £500 per annum as salary for the principal. At a public meeting on 29 April 1868 it was decided to erect a college, which was named St. Andrew's. The first council was elected in 1870, the ministerial members being Dr. Steel, Adam Thomson, Dr. Lang, and Dr. Cameron. Subscriptions of £10,000 were collected; the foundation-stone was laid by Dr. Kinross (moderator) on 9 May 1874, and the building opened on 22 July 1876, with Adam Thomson as the first principal. In 1874 Thomson was succeeded by Dr. Kinross, who was followed by Dr. Harper in 1901, and he by Dr. E. E. Anderson in 1922. In 1892 the building was enlarged at a cost of £8000. At the Union each section of the Church had a scheme for training a native-born ministry, but in 1873 the assembly appointed a theological faculty with J. B. Laughton, Dr. McGibbon, and Dr. Steel as tutors, the last-named being president. Later three professors were appointed, and numerous scholarships founded. Arrangements have also been made for lecturers and students of the Congregational Church to co-operate with the Presbyterian Church. A Presbyterian Ladies' College was established by the Assembly in 1885, when a house was rented at Ashfield. In 1891 the building at Croydon was opened; a similar college was started at Pymble in 1913, and another in 1921 at Goulburn. Cooerwull Academy, the gift of Andrew Brown to St. Andrew's College, was the first boys' college, and was followed by the Scots' College at Bellevue Hill and Knox Grammar School at Warrawee (1924). The magnificent homes for orphans at Burnside near Parramatta were started in 1909 by a gift from Sir James Burns of 45 acres adjoining his home and the sum of £1000. There are now 14 homes, with eight other buildings, and 100 acres of land, valued at over £100,000. In 1925 the Church took a great forward step in nominating families in Great Britain as immigrants, guaranteeing them work on their arrival. Twenty-seven families arrived during that year.

Victoria.—The beginnings of Presbyterianism in Victoria can be traced back to 1837, when James Clow, who had been chaplain for 15 years in the East India Company, arrived from Tasmania and held the first Presbyterian service in Melbourne on the last Sabbath of December. In the meantime, Clow not intending to take up the regular ministry, application was made to the presbytery of Sydney for a settled minister, and James Forbes was appointed, beginning his ministry in Melbourne in February 1838. The first place of worship was a wooden building, 29 feet long by 15 feet wide and 10 feet high, costing £88, and situated in Collins-street-west on ground lent by David Fisher. In September 1839 a brick church-school was erected at a cost of £524 on a crown grant in Collins-street and two years afterwards a church was built alongside it to seat 500 people. Forbes appealed to the colonial committee of the Church of Scotland to send out ministers, the first to arrive being Andrew Love, who was settled in Geelong in April 1840, and there built a church and manse in 1841 at a cost of £3000. On 7 June 1842 the first presbytery of Melbourne was formed, consisting of three ministers and one elder. In this year Alexander Lawrie was settled at Portland Bay, Thomas Mowbray at Campbelltown, and Peter Gunn in Melbourne. Among the early arrivals was W. Hamilton, who, resigning his charge of Goulburn in New South Wales, trekked overland in 1847 with his family and furniture in three drays to Port Phillip—a trackless journey of over 500 miles. In those days the government helped the various Churches not only by giving sites, but also by subsidizing congregations, allowing ministers £100 for a congregation of 100 people, £150 for 200 and so on, the maximum grant being £200 for 500 people.

The disruption of the Church in Scotland had a disturbing effect on the Victorian Church, most of whose ministers did not wish to take sides as a Church, for the colonial Church needed all the help which she could get from the homeland. Unfortunately the leaders of the British Churches were unable to appreciate the attitude and needs of the new land; and, rather than risk losing all help from outside, the Victorian Church decided to retain her connection with the Established Church of Scotland. Thereupon in October 1846 six ministers belonging to the Synod of Australia quietly withdrew, and four of them formed a synod of the Free Church of Scotland on 9 June 1847. One of these was the minister of the Scots' church in Melbourne. To fill the vacancy assistance was sought from Sydney, and Irving Hetherington of Singleton in New South Wales, after 10 years' service in that colony, was translated to the Scots' church, and inducted on 13 June 1847. He soon became a leading figure in the Melbourne Church, his church being enlarged in 1849, and the present Scots' church opened by him on 29 November 1874. In 1860 he was appointed clerk of the assembly, was elected moderator in 1869, and worked diligently for his Church till his death on 5 July 1875. In addition, some 10 men were induced to come from Britain by that doughty colonizer, Dr. Lang, who had at that time a political connection with Port Phillip; and for a time these men worked separately from the other Churches. But the three Presbyterian Churches in Victoria worked harmoniously together, and this friendliness paved the way for the union yet to come.

On 1 July 1851 Victoria was made a separate colony, and in the same year the discovery of gold caused a great rush of immigrants. To meet the increased numbers of her people the Victorian Church again appealed to the home Churches, and during the next seven years 60 ministers were added, 20 from the Established Church, 29 from the Free, and 11 from the United Presbyterian Church of Scotland. Among these were Dr. Adam Cairns, 1855, who built Chalmers church and manse; James Nish of Bendigo, who became clerk of assembly; and in 1853 Dr. Donald MacDonald, the first organizer of the widows' and orphans' fund.

On 19 April 1854 the presbytery of Melbourne was severed from the synod of Australia, and the Synod of Victoria was formed, consisting of nine ministers and two elders, and having two presbyteries, Melbourne and Geelong. On 6 October 1853 Hetherington had moved in the presbytery of Melbourne that a committee be formed to confer with the other Churches in Victoria with a view to union, and these overtures were met in friendly fashion by the United Presbyterian and Free synods; but little was accomplished, owing to the stumbling-block of state aid, till in December 1858 a Basis of Union was drawn up, and on 7 April 1859 the different

synods met for the last time as separate courts, and constituted themselves the Presbyterian Church of Victoria, with a roll of 55 ministers, representing six presbyteries. One section of the United Presbyterian Church declined to enter the union, and it was not till 1870, when all state aid was withdrawn, that this body linked up. A small company of the Free Church also stayed out, and sought the sympathy and help of the parent Church in Scotland; but the general assembly of the Free Church of Scotland in 1861 approved of the Victorian union, and refused to recognize the dissentients. These, with one exception, all entered the union at a later period. The Church at once gave herself to the work of home missions, and in the union year determined to raise £3000 as a fund to bring out 30 ministers from Britain. Dr. A. J. Campbell was the first convener of the home mission committee, and during the five years of his office the numerical strength of the ministry was increased by 50 per cent. In 1888 the assembly appointed G. Tait as superintendent of home missions; after his resignation the committee carried on for 14 years, when the office was again filled by D. A. Cameron. A Deaconesses' Institute was authorized in 1896, and founded by W. S. Rolland, under which some 22 deaconesses are at work in Melbourne and other centres.

The Church of Victoria has on several occasions been called upon to administer discipline. The best-known case was in 1881, when Dr. Charles Strong of the Scots' church was asked to explain certain statements which he had made in an article on the Atonement in the *Victorian Review*. At first he refused to reply; eventually he agreed to a resolution which urged him to make prominent in his preaching certain fundamental Christian truths. But on 1 August 1883 he invited to his pulpit in the Scots' church a Unitarian layman who lectured on religion and science, and spoke against the divinity of Christ without protest from Dr. Strong. The presbytery of Melbourne then intimated to Dr. Strong that they purposed taking action against him in their court; his reply was that he intended to resign Scots' church and leave Victoria. The case was referred to the general assembly, which invited Dr. Strong, as a member of that court, to attend its meeting and give an assurance of his belief in the divinity of Christ. He refused, and the general assembly could do no other than what it did—declare him no longer a minister of that Church, the voting being 136 to 6. The Scots' church congregation then decided to separate from the Presbyterian Church of Victoria and rejoin the Established Church of Scotland, retaining possession of the property; a bill was presented to parliament for this latter purpose, but was thrown out; and the passing of the Declaratory Act of 1882 left more room for the exercise of individual convictions on matters not essential to the integrity of the Christian faith.

Education.—As in Scotland, the church and school went hand in hand. The Scotch College began at Melbourne Academy in 1851 and was enlarged in 1873, the founder, Robert Lawson, being succeeded as headmaster in 1857 by Alexander Morrison. The government had been very generous to the Churches, giving in 1852 a site of 2 acres on Eastern Hill for a Presbyterian grammar school, and in 1853 a sum of £20,000 (and in 1855 an additional £15,000) to the five leading denominations to assist them in erecting colleges. The Presbyterian Ladies' College was started in 1875 under George Tait, who was succeeded by Andrew Harper (1879-88). The university of Melbourne gave sites for affiliated colleges; in 1874 the Presbyterian Church enclosed her site, and in 1877 the general assembly, on the motion of Dr. Morrison, decided to erect a college and to collect £10,000 for the building. Francis Ormond (q.v.) was among the first contributors, and gradually increased his gifts to a total of £45,000; to this he added as a testamentary gift £40,000. The £10,000 was also collected, and Ormond College opened on 18 March 1881, Dr. J. H. MacFarland being appointed principal. It was enlarged in 1885, and the Victorian wing (occupied by the theological hall) was built in 1888. The theological hall was spoken of in the general assembly of 1859, but not till 1865 was it actually established, Dr. Cairns supervising the lectures, and later being appointed principal. By 1882 the sum of £14,000 had been collected; to this was added a bequest from J. D. Wyselaskie, and in the following year two professors were appointed, Dr. MacDonald and Dr. Rentoul, and in 1892 Dr. Harper. Religious education has always been held of chief importance, this department being organized by the general assembly in 1860, and again reorganized in 1880 when a 'Higher Christian Education Scheme' was instituted. Robert Allan, the first Presbyterian Sunday-school superintendent in Victoria, bequeathed the sum of £10,400 for Sunday-school work, and with this a Sunday-school agent was appointed. For young men and women the Fellowship Union was started in 1888, in connection with a Lay Preachers' Association which assists the missionary activities of the Church. The union has over 100 branches and a membership of 2600.

Finance.—The Presbyterian Church of Victoria has always been sure of the liberality of her people. In 1887 the jubilee fund was inaugurated, and brought in £50,000, and in 1900 the century fund rose to over £15,000. By these funds debts were wiped out, and various permanent agencies of the Church considerably helped. In 1925 the revenue amounted to £80,606; promises to the peace thanksgiving fund were £90,970; the capital funds stood at £326,032, and the beneficiary fund at £172,047. With a communicants' roll of 36,481, besides 33,459 adherents, the Church of Victoria stands well among religious bodies.

QUEENSLAND.—The first Presbyterian service in Queensland was held in 1845 by Dr. Lang, who was at once asked by the Presbyterians of Brisbane to get for them a minister from Scotland. Although he was not successful, yet by his efforts to bring out immigrants he helped to build up the nucleus of a Presbyterian congregation in the northern city. The ship *Fortitude* (after which Fortitude Valley was named) arrived on 21 January 1849, and together with the two next ships brought 600 people for the young colony. At first Baptists, Congregationalists, and Presbyterians worshipped together as 'The United Evangelical Church,' but this did not last long; at a meeting held at Kangaroo Point on 12 December 1849 it was decided to form a Presbyterian Church, erect a building, and apply to the synod of eastern Australia for a minister, stating at the time their strong objection to state aid. The secretary of this committee was Thomas Mowbray, who had come from Victoria to Moreton Bay in 1847, con-

ducted the Brisbane grammar school, and proved a valuable friend to the Queensland Church till his death on 24 December 1867. The immediate outcome of the meeting was the purchase of a site in Grey-street (afterwards South Brisbane), where a church was opened on 25 May 1851. In 1850 the moderator of the synod of eastern Australia visited Brisbane, and at a meeting held under his presidency on 25 March a congregation was formed in connection with that synod. A school-church was built, and an invitation to become their teacher-catechist was accepted by John Scott; in 1851 W. R. McLeod was welcomed as the first minister, his district including both sides of the river. In January 1854 A. W. Sinclair was inducted, and during his ministry the Ann-street site was purchased, and a church and manse erected. The church was opened on 25 July 1858, but was burned down in 1871, and a new building erected in 1872. The second congregation in North Brisbane was started by James Love, who came from Ireland in August 1862. For a time Love's congregation used the school of arts, but, a site having been granted by the government in 1853, what was known as 'The Union Presbyterian Church' was built as a memorial to the union among the Presbyterians of Queensland and New South Wales. This was opened on 27 November 1864. The Creek-street church was started by Thomas Bell, a student brought out in 1855 by Dr. Lang from the United Presbyterian Church of Scotland. Here was the congregation already referred to as consisting of Baptists, Congregationalists, and Presbyterians, which decided to sell the property, and divide the proceeds (£1500) among the three denominations. Dr. Lang bought the portion of land on which the church stood, and in this building Bell's congregation continued to worship till they opened a wooden church in Creek-street on 13 June 1859. In 1852 the colonial committee of the Established Church of Scotland appointed W. L. Nelson, to proceed to Moreton Bay. On arrival in Sydney he was on 30 August 1853 inducted to Ipswich in Queensland, by the Sydney presbytery of the synod of Australia, and on 25 September held the first Presbyterian service in Ipswich in a wooden building in Ellenborough-street. Rockhampton was formed by the Canoona gold-rush in 1858, when W. J. Brown, a collector of customs, began services. In May 1861 Samuel Kelly came from Victoria, and was inducted in June.

In December 1862 Adam Thomson, of the United Presbyterian synod, Sydney, visited Brisbane, and by invitation preached on Church union. A conference of delegates was held on 3 July 1863, to devise means for Queensland to join the union movement in New South Wales. Helpful counsel was also received from Dr. Steel of Sydney, and on 25 November a Basis of Union was adopted and the Synod of the Presbyterian Church of Queensland constituted, with S. Wilson as moderator and James Love as clerk, eight ministers forming the synod. As the number of members was small, it was felt that the formation of presbyteries was premature, so the synod met as a presbytery in the various districts represented till 8 November 1865, when three presbyteries were formed—Brisbane, Toowoomba and Rockhampton. 1866 saw an addition of six ministers to the synod.

For the guidance of the Church the rules and forms of procedure of the Victorian Church were at first adopted, with a few modifications; it was not till 1874 that the Queensland Church had her own rules, mainly through the instrumentality of Dr. Nelson, who was appointed convener of the property committee, and who planned the incorporation of the Church by act of parliament in 1877. By this act the moderator, clerk, and treasurer of the assembly became the Church trustees, and the rights of congregations with regard to the use of church buildings and grounds were preserved. For many years the Queensland government granted for £5 a pass over all the railways to ministers of religion, thus materially assisting home mission work. In 1884 a fund of £1070 was raised for bringing out ministers from Britain. In 1891 the home missions were again reorganized, and the interest of the people in the claims of their own colony fostered by a scheme of interpresbyterial visitation.

The training of young men for the ministry occupied the attention of the 1864 synod, and in 1872 a committee was set apart to draw up a scheme, with C. McCulloch as convener. In 1875 they had £1300 in hand, and £375 for a library, mostly collected from the Wickham-terrace congregation. The Divinity hall was opened in March 1876, the first tutors chosen by the assembly being A. McCulloch (principal), Alexander Hay, C. Ogg, and W. L. Nelson. In addition there are now three secondary colleges with 290 students. A scheme for aged ministers was brought forward by Dr. Nelson in 1872, and adopted by the assembly, the widows' and orphans' fund being initiated afterwards, and a reconstruction taking place in 1898.

TASMANIA.—To this State belongs the honour of having the first Presbyterian minister settled in Australasia. Authentic history gives 1821 as the year in which Presbyterian settlers of Hobart and the vicinity wrote to the United Associate Presbytery of Edinburgh, asking that a minister be sent out. By this presbytery Archibald MacArthur was ordained on 22 January 1822, and inducted to the Presbyterian congregation at Hobart. He reached Hobart in December of that year, and began his ministry on the second Sabbath (12 January) of 1823, his salary (£200 per annum) being subscribed in equal parts by the settlers and the government; on 1 January 1826 an additional £50 was granted. The first Presbyterian church in Tasmania was built on a crown grant to the congregation of St. Andrew's and opened on 12 September 1824; the building is still used as a schoolroom of that church. Officialdom hindered rather than helped the expansion of the Church, the Church of England being the only religious body recognized by the authorities; even the right to officiate at the baptisms, marriages, and funerals of its own people had to be strenuously fought for, and state aid was for a long time withheld. The second church was established in 1826 at Kirklands on the Macquarie River, where John Mackersey ministered from 1829 to 1854. In 1828 James Garrett arrived, and was soon after appointed to Bothwell, where a church was built in 1830. Launceston's first settled minister was John Anderson (16 June 1832). The Presbytery of Van Diemen's Land was formed by an ordinance of the Church of Scotland on 6 November 1835, Dr. Lang of Sydney, authorized by the presbytery of Sydney, being the first moderator. Before this happened, however, MacArthur had

resigned (on 1 November), and the Hobart church was vacant for two years. In 1837 John Lillie arrived to take charge of St. Andrew's, Hobart, and did good service for the Church in Tasmania for over 20 years. Among his most notable lay helpers was Adam Turnbull, an elder of St. Andrew's, who was for many years secretary to the local executive and legislative councils, but resigned in 1854 owing to his disagreement with the then official policy of continuing transportation. Soon after his resignation he entered the ministry and was appointed to the church at Campbelltown, where he died in 1891. Dr. Lillie himself was forced by ill-health to resign his post in 1858, and died in New Zealand in 1866. He was followed at St. Andrew's by J. G. Macintosh (1858-60), John Storie (1860-79), and James Scott (1880-1905). John Storie's term was distinguished by much bitter quarrelling, and the presbytery twice attempted (without success) to induce the government to withdraw his stipend. James Scott, on the other hand, was a man of great enthusiasms and widespread influence. As a young minister he was located at Bacchus Marsh in Victoria, but in 1870 was transferred to St. John's church in Hobart, and his appointment to St. Andrew's signified the amalgamation of the two charges. He was a founder of both Officer College and the university of Tasmania, and was elected by parliament to the council and the senate of the university. He also took a large share in drafting and passing the Presbyterian Church act of 1878; and in 1891-2 he was moderator of the federal assembly of Australia.

The problem of *education* soon claimed the attention of the Tasmanian Church, and in 1847 Governor Denison wrote in complimentary terms of Presbyterian activity in that direction. The legal basis of the Church was fixed by the Presbyterian Church act of 1878, and rules were adopted in 1880. At the disruption of 1843 a few ministers separated from the Tasmanian Church and formed a Free Church presbytery; this, however, re-united with the Tasmanian Church in 1896, which year saw the formation of the present Tasmanian assembly. During the separation the two bodies worked together in many ways, co-operating in the establishment of the *Presbyterian Magazine* and in the appointment of R. M. Fraser as missionary to Epi, New Hebrides, in 1882. In this year a forward movement took place in organizing the religious education of the rising generation. From 1855 onwards efforts were made for union with the Presbyterian Church of Victoria, but this was not accomplished till 1912. Tasmania was, however, included in the Union of the Presbyterian Churches of all the Australian States in 1901.

SOUTH AUSTRALIA.—The first Presbyterian minister to come to South Australia was Ralph Drummond, who was ordained by the United Secession Church at Crail in Scotland, arrived in South Australia in 1837, and began services at his own house in Angas-street, Adelaide. On 18 October 1839 a congregation known as the Gouger-street Secession Church was fully organized by the election of elders and a committee of management, the church being built and opened in 1841. It was afterwards known as the United Presbyterian Church. The building becoming too small, the present church was opened on 27 October 1865. The session of Gouger-street church, fulfilling the functions of a presbytery, received William Davidson and Alexander Law; Davidson ministered to the settlers north of Gawler as far as what is now Jamestown and Yongala, with headquarters at the Burra Burra mines; Law was sent to Port Augusta, but afterwards became minister of Mount Barker and Monarto. The congregation at Mount Barker was originally a congregation of the Free Church, but seceded in order to call Law, who was a minister of the United Presbyterian Church. Port Adelaide became a Free Church congregation. From the Church of Scotland came Robert Haining in 1841. After he had preached by permission in the Anglican church on North-terrace, and later in the Congregational church in Freeman-street, a small building belonging to the Wesleyans in Hindley-street was leased and regular services were begun. In 1844 a more commodious church was erected in Grenfell-street, and St. Andrew's church in Wakefield-street was opened in 1859. During the earlier years of Haining's pastorate congregations were established at Morphett Vale, Inverbrackie, and Ardtornish.

The disruption of 1843 naturally affected the Presbyterian community in South Australia. In 1849 several influential Presbyterians holding Free Church principles sent to the colonial committee of the Free Church of Scotland a memorial asking that a minister be sent to South Australia. The position was offered to John Gardner, who, ordained in Glasgow in 1840, was at this time minister at Birkenhead. He arrived in Adelaide in March 1850, and Chalmers church on North-terrace was built and opened on the first Sunday in January 1851. Within 10 years congregations were formed at Smithfield, Clare, Gawler, Morphett Vale, Strathalbyn, Mount Barker, and Port Adelaide.

The United Presbyterian congregations and those of the Church of Scotland did not form themselves into presbyteries, the metropolitan sessions receiving ministers and inducting them. Up to the time of the union there were no presbyterial ordinations, except by the Free presbytery. On 9 May 1854 the Presbytery of the Free Presbyterian Church of South Australia was formed, the first members being J. Gardner (Chalmers church), John Strachan Moir (Smithfield and Gawler), John Anderson (Strathalbyn), ministers, and George Young and James Benny (afterwards ordained as a minister), elders. At a public meeting in Chalmers schoolroom on 3 January 1865, consisting of ministers, elders, and deacons connected with the three churches, a resolution was framed in favour of union, and a Basis of Union was subsequently approved. On 10 May the union was consummated and the Presbyterian Church of South Australia was formed; the assembly consisted of eight ministers and seven elders. In March 1886 the general assembly came into existence with two presbyteries, Adelaide and Belalie. Subsequently the presbytery of Onkaparinga was formed out of the presbytery of Adelaide. From the time of the union in 1865 to the erection of the assembly eight charges and preaching-places were added, and by 1922 some 14 more.

Education.—The Scotch College for boys was established in 1919 in an area of 30 acres, and has a roll of 235 students. A college for girls was opened in 1922 at Glen Osmond with 100 students. In 1920 the assembly came to an arrangement with the Parkin college (see CONGREGATIONALISTS) for the joint training of students for the ministry.

Among the prominent ministers have been:—George Davidson, D.D., of Flinders-street church from 1898, first editor of the *Banner*; John Davidson (Chalmers church, 1870), who was appointed first professor of English and philosophy in the university of Adelaide (1874) and resigned his pastorate in 1877; William Gray, born in South Australia in 1854, missionary at Tanna in the New Hebrides in 1882-94, clerk of assembly 1902-11, financial secretary 1905-16, author of a Tannese grammar and translation of St. Luke's Gospel into Weasisi; Matthew Johnson, a vigorous home-mission convener and able clerk of assembly; James Lyall, who did good work for both home and foreign missions; Robert Mitchell, founder of the Smith of Dunesk mission, out of which has grown the Australian inland mission; Dr. David Paton, home-mission convener for 14 years; J. T. Robertson, who rendered valuable service for the incorporation of the Church and the provident funds; and Dr. Seymour, who was tutor in Church history.

WESTERN AUSTRALIA.—In 1879 David Shearer of Gateshead-on-Tyne was commissioned by the colonial committees of the Established and Free Churches of Scotland to proceed to Perth and undertake the formation of the first Presbyterian congregation. He arrived with his family on 2 October, and began his ministry on the following Sabbath in St. George's hall, Hay-street. The Presbyterians of the colony then numbered 529. Three years later St. Andrew's church was erected. In 1886 Robert Hanlin was sent by the Free Church of Scotland to establish a Church at Fremantle; he began his work in the Oddfellows' hall on 10 October, his first congregation numbering 11 persons. Four years later (1890) Scots' church was built. In 1888 the task of initiating the work at Albany was undertaken by W. L. Grierson. The first presbytery was formed on 7 December 1892 by James Gibson under a special commission from the Presbyterian Church of Victoria, and comprised the congregations of Perth, Fremantle, and Albany; Geraldton was the first place to receive the attention of the presbytery, and in March 1894 St. John's church was opened there. In August John McNeil, under the Presbyterian Church of Victoria, visited the newly-discovered goldfields, and held services at Southern Cross, Coolgardie, Kalgoorlie, Whitefeather, and other places. On his recommendation work was begun early in 1895 by J. A. Burns.

The first general assembly was constituted on 10 April 1901, consisting of three presbyteries, Perth, Fremantle, and the Eastern Goldfields. The next forward move of the Western Australian Church was a vigorous home mission campaign with lay missionaries. This was directed at first to the goldfields, as long as there was a population there, and afterwards to the new agricultural areas. Nor was the very sparsely inhabited north-western district of the State neglected, churches being built at Port Hedland and Broome. But the strain of these was far too heavy for the small Church, and the general assembly of Australia took up the field and extended the work under the Australian inland mission. The home mission department has received much financial aid from the Scottish Churches, and 11 stations are at work. The Women's Missionary Union has also been of great help in many of the Church's activities, having five branches, 11 affiliated guilds and 222 members. An assembly hall was opened in March 1922 by Governor Newdegate. Two colleges have been established—Scotch College with 207 boys, and the Ladies' College with 214 girls.

Statistics for the Commonwealth, 1924.—Number of presbyteries, 53; charges, 802; churches, 1348; schools, 444; ministers, 639; elders, 3175; communicants, 78,218; Sunday-schools, 1220; Sunday-school teachers, 8770; Sunday-school scholars, 76,992; value of property, £3,650,422.

W.A.S.A.

Price, CHARLES (1807-1891), born in London on 21 November 1807, and educated at Highbury College in 1829-32, sailed for Tasmania in 1832 as chaplain aboard the *Princess Royal*, which was blown ashore at Frederick Henry Bay on 17 August, the passengers reaching land in safety. Price's first sermon in Hobart Town was preached on 2 September. Moving to Launceston, he preached in the old court-house in Cameron-street. In 1833, hearing that there was an Independent chapel unoccupied at Sydney, he moved there on 7 February, 1833, and on the 13th opened the Pitt-street chapel. An application for a minister had been sent to England, and seven weeks later William Jarrett arrived unexpectedly. Price magnanimously resigned in his favour, refusing at the same time to establish a second Church in Sydney. In July he accepted a call from Sir Edward Parry, superintendent of the Australian Agricultural Company, to officiate at Port Stephens; here he remained until 1836, when he was succeeded by William Macquarie Cowper (afterwards Dean of Sydney). Price then returned to Launceston and opened a grammar school (which he conducted for 26 years), and on 26 October accepted the pastorate of the local Church, in which he continued to labour for well over 50 years. The Tamar-street chapel was opened on 6 September 1837. Price's work was unpaid for 14 years. He took an important part in civic life, and, being a man of considerable scientific attainments, was the first in Launceston to make telephones and microphones and one of the first to exhibit electric light. He died at Launceston on 4 August 1891. See CONGREGATIONALISTS.

F.V.P.

Price, JOHN (1808-1857), born in Cornwall on 20 October 1808, migrated to Tasmania in 1835 and took up farming; but in 1838, having displayed great energy in tracking down bushrangers, he was made police magistrate at Hobart, and in 1845 succeeded Major Childs as commandant at Norfolk Island (q.v.), which had on 29 September 1844 been transferred from the jurisdiction of New South Wales to that of Tasmania. Childs (whose predecessor Alexander Maconochie, q.v., had been humane but overmild for the type of criminal with whom he had to deal) had attempted to restore the balance by great severity; Price moderated this over-severity, but inherited the Childs reputation. The officer commanding the garrison during Price's term, however, in an estimate of the civil commandant's character written many years afterwards, described Price as absolutely just, stern towards the incorrigible, and kind to the well-behaved. But no man, disciplinarian or humanitarian, could master the horrible conditions of that penal hell; nothing less than complete abolition would suffice, and after years of struggle Bishop Willson and Sir W. Denison between them succeeded in persuading the British government to transfer the prisoners to Port Arthur.

In 1853 Price was made head of the penal department at Melbourne, where the influx of criminals from Tasmania during the first gold-rush had rendered necessary the fitting-up of prison-hulks moored in Hobson's Bay. Here his habits of severity strengthened, and he allowed subordinates to outdo him in this respect. Consequently when, on 26 March 1857, a number of convicts refused to work and Price went in among them fearlessly to discover what they complained of, they fell on him and battered him severely with their quarrying tools. He died of his injuries on the following day. Brave, stern, and just, he was of the old type of prison officials, and his methods had had their day.

Price, THOMAS (1852-1909), born at Brymbo near Wrexham in North Wales on 19 January 1852, and educated at a penny school in Liverpool, adopted the trade of a stonemason, and identified himself with the temperance movement, becoming a prominent Rechabite. In 1883 he migrated to South Australia for the good of his health, and found temporary employment as clerk of works in the government locomotive workshops at Islington; then, returning to his old calling of stone-cutter, he was employed on the new parliament buildings on North Terrace, Adelaide. In 1891 he became secretary of the Masons' and Bricklayers' Society, and in April 1893 was elected to the legislative assembly as the Labour representative of Sturt. For this constituency he sat until 1902, in 1901 becoming leader of the Labour party in parliament. In May 1902 he was elected to the assembly for Torrens, and held the seat till his death. On 26 July 1905 he became premier of South Australia—the first Labour premier in any State; his cabinet was a coalition of Liberal and Labour members. During his four years' premiership he was responsible for acts relating to wages boards, the municipalization of the tramways (which had previously been in the hands of seven companies), and the transfer of the Northern Territory to the Commonwealth—which eventually took place in 1910. He died at Adelaide on 31 May 1909, at the height of his popularity as premier. He was a strong 'platform personality,' a fluent and forcible speaker, and one of the few political leaders who are known to have altered opinions and influenced voters at the last moment by humour and eloquence.

Price-fixing began in Australia when Governor Hunter in 1797 fixed the price for a number of commodities and laid down conditions and fixed wages for labour. An axe was to cost not more than 2s., a new hoe 1s. 9d., a sickle 1s. 6d.; the 'hire of a boat to carry grain' was to be 5s. a day. Wages were fixed at 1s. per day with board, 2s. 6d. without. Three years later Governor King told the colonial office that this ordinance was utterly disregarded, but he attempted to control prices by limiting the percentage of profit to 20 per cent; he also tried to fix the price of meat. In 1804 a general order put the price for the ensuing year at 1s. 9d. a lb. for beef, 1s. for mutton, and 8½d. for pork. Governor Macquarie in 1810 discontinued price-fixing on the ground of impolicy; 'the Farmer and Grazier' he said, 'ought to be encouraged by every possible means to increase their agriculture and stock.' By opening up the country and encouraging the increase of flocks and herds, he and his successors lowered the price of meat, and in 1828 good beef was quoted in Sydney at 2s. 2d. a stone. No more experiments in price-fixing are recorded until 1906, when an attempt was made to fix a maximum price for certain classes of agricultural machinery (see NEW PROTECTION).

In most States of the Commonwealth the great rise in prices which followed the inflation of credit due to war finance occasioned legislation to fix prices and limit profits. This outcrop of legislation is best studied in the reports of lawsuits initiated under it. In 1921, for example, the supreme court of New South Wales had to determine whether powers which (as regards necessary commodities) had been given to the profiteering prevention court were exercisable when there had been no sale, but only offers to sell; also, what was satisfactory evidence of 'unreasonable profit;' also, whether the president was entitled to fix retail selling-prices of meat for the whole of the trade irrespective of the actual cost to each particular seller, and whether he could do this for a part of the State only. In Western Australia at the same time an order-in-council under the prices regulation act of 1919 declared that the maximum wholesale prices for pollard per ton in the metropolitan area should be, for millers £7 15s. at the mill door or on rail at siding, and for wholesalers other than millers, if sold in bagged lots, £8 5s. The supreme court of the State held that order-in-council was bad for fixing more than one maximum wholesale price for pollard.

The high court of Australia declared a provision of the Queensland profiteering act of 1920 unconstitutional and invalid when applied to sales by travellers in Queensland of goods stipulated to come from Sydney. The act purported to provide that it should be unlawful for any trader, principal, or agent, to sell or offer any commodity at a price higher than a price declared in the *Queensland Gazette*, whereas the federal constitution lays it down that trade, commerce, and intercourse among the States shall be absolutely free.

The length to which the New South Wales act went may be judged from the *Industrial Gazette* of December 1922 (pp. 1215-24), which declared the following to be necessary commodities:—(*a*) Coal . . . or other fuel, (*b*) any article of food or drink . . . , (*c*) any article of clothing or apparel . . . , and so on down the alphabet; it dealt also with necessary services, even to burial of the dead. Then followed a list of about 75 'necessary commodities'—including oil (castor)—which had been exempted from the operation of the law; and then a 7-page inventory of prices current as determined by the court and still in force. This statute, however, was a temporary expedient, expired at the close of that year, and was not renewed. In its stead, the monopolies act of 1923 was passed; it is aimed at all who monopolize or combine to monopolize any trade or service with intent to control prices or supply to the detriment of the public. Legislation in other States has shown the same tendency.

Certain monopolies have also been dealt with. New South Wales in 1912 experimented with a gas act which regulated the illuminating power and purity of the gas supplied by private companies, as well as the pressure to be maintained, accuracy of meters, and price. The price was fixed in the act at 3s. 6d. per 1000 cubic feet, alterable on a sliding scale to balance any demonstrated increase in cost of production; if less than the statutory price is charged, companies are permitted to pay an increased dividend. To prevent the 'watering' of capital it

insisted that new capital should be raised, when needed, by selling new shares at auction. The act is badly drawn and difficult to understand, but has proved satisfactory in principle; the community is in a great measure protected by it, and the proprietors work comfortably enough under it. It was applied at first only to the metropolitan, North Sydney, and Newcastle companies, but by virtue of proclamations issued since has been extended to include one suburban and three country companies. Since dividends are standardized as well as prices, investors are apt to look upon these stocks as guaranteed by the State.

In 1916 Queensland passed a similar statute. The monopoly enjoyed by a gas company is held under the protection or licence of the State either directly or through its municipalities, and is therefore considered a fit subject for governmental control. In Melbourne the metropolitan gas company's act of 1878 (amended in 1920) deals with this subject; it does not limit dividends or prices, but requires the price of gas supplied to private consumers to be uniform. It also makes provision for the raising of further capital, and regulates pressure, purity, meters, etc. in the public interest. F.A.A.R.

Prickle Shark. See DOG-FISHES.

Prickly Pear, a term widely used in Australia and elsewhere to designate certain plants belonging to the Cactaceae. Nearly all members of the family are indigenous to America; but many species have become naturalized in different countries of the eastern hemisphere, and some, finding the conditions congenial, have thriven to such an extent as to constitute veritable pests. This has occurred in parts of India, Ceylon, South Africa, and especially in Australia —also, to a less extent, in portions of the Mediterranean littoral.

About a dozen species have become naturalized in eastern Australia; of these *Opuntia inermis* easily takes first place as a pest, having invaded and occupied far more territory than all the other introduced prickly pears taken together. Its native home includes the Greater Antilles and the adjacent gulf-shores of the United States, where it occurs as a rather uncommon plant.

Next in importance is the Spiny Pest Pear, whose correct botanical name seems to be *O. maideni*, though it is also quoted as *O. stricta*. Its habit rather closely resembles that of *O. inermis;* but the plant has a more erect growth, its joints are much smaller, and are commonly provided with a small cluster of large spines at each areole. This species is very common in parts of the watersheds of the Fitzroy, Burnett, and Mary rivers. It is the dominant prickly pear of the eastern portion of central Queensland, being replaced in the south and west by *O. inermis*. The original habitat of this 'Burnett pear' is not yet known, as the plant has been confused with certain others (such as *O. inermis* and *O. di leni*), but it is probably in the vicinity of the Caribbean Sea.

Opuntia tomentosa is a rather widely distributed 'tree pear,' occurring in the vicinity of Rockhampton, Emerald, Westwood, Gogango, and other localities in central Queensland, as well as near Helidon in the southern part of that State. It is a southern Mexican plant, readily distinguished from the other naturalized species by its tree-like growth, its almost spineless, deep green, velvety segments, and its small pinkish-red flowers and fruits.

Among the remaining species three are notable, *O. aurantiaca, O. monacantha* and *O. megacantha*. The first-named is a Uruguayan plant with a prostrate habit and a marked reddish or purplish colour when growing in the open. It is extremely brittle, the rather small, narrow, elongate and often cylindrical joints becoming readily detached and (owing to the presence of abundant long barbed spines) easily transported by sheep, cattle, or other animals, and they are readily disseminated by running water. It occurs near Roma and Warwick in Queensland, and in parts of the upper Hunter valley and in the Windsor district in New South Wales. In South Africa it has occasioned considerable anxiety and expense, its eradication having been ultimately brought about by systematic poisoning with arsenical solution, followed by collection and burning.

Opuntia vulgaris (*monacantha*), a Brazilian 'tree pear,' has a scattered distribution in eastern Australia, occurring in isolated localities, mainly in northern coastal Queensland, but extending to Sydney, Melbourne, Adelaide, and Perth. It was formerly prevalent in certain parts of northern Queensland (Bowen, Townsville, Charters Towers, Suttor River) but has been fully controlled and in many places exterminated as a result of the ravages of the 'wild cochineal' insect, *Coccus indicus*, introduced from India and Ceylon early in 1913 by the Prickly Pear Travelling Commission.

O. megacantha, or perhaps *streptacantha*, a native of the plateau of northern and central Mexico, is closely related to the pest-pear of the Hawaiian Islands, the spiny prickly pear of the Mediterranean and the common tall spiny pest-pear of eastern Cape Colony. It is fairly common between Rockhampton and Westwood, where it may assume a somewhat tree-like habit; but it usually forms dense clumps, reaching a height of nine or ten feet. The very large, thick, heavy, gray segments are provided with clusters of strong, twisted, whitish spines at each areole.

Other species of less present importance in Queensland or New South Wales are *O. elatior, O. imbricata, O. microdasys, O. ficus-indica, O. dilleni, O. amycloa, Nopalea dejecta*, and *N. coccinilifera*. None of these are abundant in this continent, but *O. dilleni* is the chief pest-pear of Ceylon and southern India, whereas *O. elatior* is the commoner kind in central India.

Some species of prickly pear were introduced (for cochineal growing) into Australia by Governor Phillip in 1788; among them were probably *O. monacantha* and possibly *O. elatior* and *O. inermis*. The others are, for the most part, to be considered as 'garden-escapes' which found conditions highly favourable for their propagation and dissemination. Some species were certainly introduced into central Queensland for the sake of their edible fruit. The centre of distribution for the common pest-pear was Scone, whence it was transported to a few localities on the Darling Downs on account of its succulence, drought-resisting qualities, and its possible utilization as a reserve fodder for starving stock. Specimens of some kind of prickly pear were also sent to Moreton Bay in 1824 by the then colonial botanist, Charles Fraser, 'for the use of settlement.'

It is difficult to estimate the actual area of the invaded territory, but there were perhaps 30 million acres of infested holdings in Queensland in 1922; the official figures compiled for New South Wales indicate an area of approximately six million acres (1925). This huge

total of perhaps 36,000,000 acres (over 56,000 square miles, or more than twice the size of Tasmania) is more than twice as great as the total area under cultivation in Australia. The recently appointed Queensland Prickly Pear Land Commission controls an area of approximately 51,500,000 acres (1925), not all of which is infested, but there are infested areas in that State at present outside the jurisdiction of the commission. In certain districts there is a continuous occupation by the pest, plant touching plant for many miles. In other localities the infestation is more scattered, and there may be only a few plants per acre, but it is from such lightly-infested conditions that the present densely-infested regions have ultimately resulted. The annual increment is estimated at at least a million acres in Queensland, and at about five per cent in New South Wales.

The districts chiefly affected comprise a broad belt in the vicinity of the dividing range, and the region immediately west of it extending to the great plains. The soil on the whole is good, a very large part of the infested zone being agricultural land. The area in Australia invaded by the pest-pears is confined practically to the region with an average annual rainfall between 20 and 30 inches, received especially during the five summer months (November to March), but with an average of an inch or more during most of the remaining months. It lies north of the line indicating uniform summer and winter components of the rainfall—i.e. a line from the New South Wales coast south of Newcastle to Dubbo and Brewarrina or Bourke—and has not invaded those parts of tropical Australia which have a purely summer fall. The average annual temperature of the infested regions ranges from 67° to 75° F., with a mean midwinter minimum of about 52° F. At present the pear is spreading westward into the region (partly in Queensland, partly in New South Wales) where the average annual rainfall lies between 20 and 17 inches. The course of its progress has been mainly along stock-routes and railways and down streams. Cattle are very important distributors, not only by breaking off segments, which then may take root or may be carried by water to give rise to new plants, but also by the dissemination in their droppings of seeds with germinating power unimpaired. Cattle, horses (occasionally), and various birds, more especially the emu, crow (q.v.), and perhaps the scrub turkey, are capable of distributing seed widely through their droppings.

Control of the pest in Australia constitutes perhaps one of the most important economic biological problems of this type in the world. Destruction of dense pear may be carried out by mechanical means where soil and climatic conditions favour agriculture. The timber is burnt and the pear crushed and ploughed in. It is the most economical method of clearing. The only effective spray is a preparation of arsenic pentoxide and sulphuric acid. This is an acid circulating poison that goes right through the plant and kills to the roots. Arsenic and soda as a spray is not effective, as it only kills the leaves and very often not all of those. If each branch is opened and arsenic put in the cut it is effective, but the cost of doing this renders it prohibitive. Arsenic pentoxide alone is only suitable for very young pear with little skin resistance.

In 1912 the Queensland government sent abroad a travelling commission to investigate the possibility of controlling the pest by biological means, i.e. by utilizing its natural enemies, or by utilizing the plant or its products industrially. The commission on its return in 1914 recommended that certain insect enemies and a fungous disease, all known to be restricted to cactaceous plants, should be introduced from abroad; certain of them were either sent across or brought back by the commission, but only one, the wild cochineal insect (*Coccus indicus*) actually became established in Australia. This insect, an importation from southern Ceylon and north-western India, soon brought about the control of one kind of prickly pear (*Opuntia monacantha*), which it practically exterminated in those districts of northern Queensland where it was liberated. It was this remarkable result which led ultimately to the really serious attempt, begun in 1920, to control the pest by biological means. The question of commercial utilization as a means of control was carefully inquired into, the assistance of experts in various countries being freely availed of. The pulping properties of the fibre were ascertained to be of so little value as to render it of no use economically as a material for the manufacture of paper, strawboards, etc.; the mucilage so abundant in the plant was also reported to have no commercial value. The utilization of either the fruit or the whole plant as a source of alcohol was fully investigated, but an adverse report was presented, on account of the low content of starch, sugar, or other alcohol-producing carbohydrate.

Information was collected regarding the utilization of various species as a fodder for stock; it was ascertained that the addition of some highly nutritive or more concentrated material (such as cotton-seed meal, oil-cake, lucerne, or bran) was necessary to form a balanced ration, the chief value of the cactus being as a roughage. It was suggested by the commission that careful experiments should be undertaken in Queensland to test the value of the local prickly pear, and this was subsequently done at Wallumbilla, with results somewhat like those obtained elsewhere; the main value of the plant was found to be that of an emergency fodder during periods when more suitable stock-feed was scarce, its use as part of a maintenance ration needing the addition of some food-stuff rich in protein to be satisfactory. Hay was ascertained to be a suitable addition, the proportion of pear being least in the case of dairy cows and greatest in the case of dry cows. A reduction in the yield of butter-fat was recorded when prickly pear was fed to dairy cows—the higher the amount of pear used the greater the diminution of the fat content; fattening of cattle or sheep that involved the use of prickly pear as part of the fodder was therefore unlikely to be economic. It has been suggested that the ash of the plant might be used as a source of potash, but this method of utilization has not been proved a commercial success.

The projected attempt to control the pest by means of its natural enemies was deferred during the war, but the Commonwealth Institute of Science and Industry at length succeeded in securing the co-operation of the governments of the Commonwealth, New South Wales, and Queensland, work being commenced in the middle of 1920. Among the most promising of the various insects introduced from America are the cochineal insects (*Coccus* or *Dactylopius* spp.) and pyralid moths belonging to the genera *Melitara, Cactoblastis,* and *Mimorista,* which are highly destructive to prickly pear during their caterpillar stages. Other important enemies

which are being utilized are various species of cactus bugs (*Chelinidea* spp.) and cactus longicorn beetles (*Moneilema*). Among the introduced disease-producing organisms which have been investigated, the chief are certain fungi (*Gleosporium* and *Macrophoma*) and a bacterium (*Bacillus cacticidus*), but their utility depends very largely upon the prevalence of warm moist climatic conditions. It has been ascertained that some of the introduced insects are capable of transmitting the bacterium and one of the fungi just named. Investigations regarding the possibility of controlling prickly pear by utilizing its natural enemies are still being continued in Queensland and New South Wales. *Coccus* and *Melitara* insects are now being distributed in prickly pear areas and are doing excellent work. Cactus bugs have also been set free; the others mentioned do not breed satisfactorily.

The literature of the prickly pear problem is scattered over official reports and the journals of many learned societies. Enquirers should consult articles by J. H. Maiden in the *Agricultural Gazette of New South Wales* (1911-20), T. H. Johnston in the *Agricultural Journal of Queensland* (1921-2), the *Transactions* of the Royal Society of South Australia (1923-4), and the *Report* of the Australasian Association for the Advancement of Science (1923), and official reports by J. White Haney (Queensland department of lands, 1912-16), T. Harvey Johnston and H. Tryon (Queensland travelling commission, 1914), and W. B. Alexander (*The Prickly Pear in Australia*, 1919, *Prickly Pears Acclimatized in Australia*, 1925, and *Natural Enemies of Prickly Pear and their Introduction into Australia*, 1925).

T.H.J.

Printing. *New South Wales.*—George Hughes was Australia's first printer, and the first printing was done in November 1795, when, Collins records, 'a small printing press, which had been brought into the settlement by Mr. Phillip, and had remained from that time unemployed, was now found very useful; a very decent young man, one George Hughes, of some abilities in the printing line, having been found equal to conducting the whole business of the press. All orders were now printed, and a number thrown off sufficient to ensure a more general publication of them than had hitherto been accomplished.' The printing-press referred to was a wooden one, brought, together with some type, in the First Fleet by Governor Phillip; it had lain idle until Governor Hunter discovered George Hughes among new arrivals, and attached to government house a printing-office, from which, as Collins relates, were issued his government and general orders. On 22 November 1800 George Howe (q.v.), a creole from St. Kitts who had been a compositor in the office of the London *Times*, arrived in the colony, and Hunter brought him into employ as government printer. This George Howe is the 'ingenious man' referred to in King's despatch dated 9 May 1803. It is sometimes said, on the strength of a marble tablet set up in the old *Sydney Gazette* office, that printing was first done in Australia by George Howe; but Howe did not reach the colony until November 1800. After his arrival, however, he was for many years the only printer in New South Wales, and the early development of the industry is narrated under his name and that of his son Robert.

Victoria.—When Lieutenant-governor David Collins arrived at Sorrento in 1803, he had with him a small hand-press, which he set up under a gum-tree on the beach, and in this 'office,' on 16 October, was printed the first government order. A series of general and garrison orders were printed and issued from time to time for the enforcement of good government and discipline among the free settlers and convicts and the small military force. This veritable 'Jail Journal' was Victoria's first printed periodical. There were three printer-convicts in the party—Robert Walsh, the only one whose name survives, died at Hobart in September 1804.

The first newspaper, the *Melbourne Advertiser*, was issued in March 1838, numbers 1 to 9 being published in manuscript. Each issue was probably limited to about a dozen copies, and very few of these are extant. Number 10 and a few later numbers were printed, but as the paper was not licensed it was suppressed by order of the commandant. The first authorized newspaper printed in Victoria was *Port Phillip Gazette*, which Arzen and Strode began to publish on 27 October 1838. Early in 1839 John Pascoe Fawkner (q.v.) obtained a licence, and on 6 February re-issued the *Advertiser* under the title of the *Port Phillip Patriot and Melbourne Advertiser*.

Tasmania.—Lieutenant-governor Collins brought with him from Port Phillip the small printing-press which had already made history by being the first press in what is now the State of Victoria. As at Port Phillip, he set it up under a gum-tree, and on 20 February 1804 a printed sheet issued from it—a 'general order' which fixed the weekly ration of pork and other comestibles. A year later the official employment rolls of Tasmania ceased to include a printer, and for some time the use of the press appears to have been infrequent, though it still issued government orders until 1810. The first newspaper was the *Derwent Star*, which was published at Hobart in that year. See BENT, ANDREW.

Western Australia.—The first printing-press introduced into Western Australia (a 'Ruthven') was imported from Launceston by one Weavell in 1831. This little hand-press, which is believed to have been the first one used in Tasmania, was set up at Fremantle and hired by C. Macfaull and W. K. Shenton, who printed on it the *Fremantle Observer, Perth Gazette and Western Australian Journal*, the first issue of which appeared on 25 April 1831. It was housed in a shed at Colonel Lautour's flour-mill, but was shortly afterwards removed to Hamilton Hill a few miles out of Fremantle, where the publication of the *Observer* was continued for over 12 months. In 1832 the press was purchased by Captain W. T. Graham, who, in conjunction with W. N. Clark, T. N. Yule, and S. F. Johnston, commenced publication of the *Western Australian* and, afterwards, the *Inquisitor*. It was then removed to Perth and used by W. N. Clark to print the *Swan River Guardian*, and later by E. Stirling for the *Western Australian Magazine*. It is now an exhibit in the public museum of Western Australia at Perth.

South Australia.—The history of printing in South Australia dates from the proclamation of the province in 1836. The first press was brought from England by Robert Thomas and George Stevenson, the proprietors of the *South Australian Gazette and Colonial Register*. The plant consisted of about half a ton of bourgeois and brevier type, a good fount of small pica for printing official documents, a quantity of general jobbing type, and a demy Stanhope press of the most antiquated pattern. The initial number of *The Gazette and Register* had been issued in London on 18 June 1836, in

accordance with the ambition of the promoters 'to print the first number of their paper in the capital of the civilized world, and the second number in a city of the wilderness,' the site of which was then unknown. The plant and stock-in-trade were then shipped by the sailing-ship *Africaine* to Holdfast Bay, and on arrival the press was erected on the beach; but the second appearance of *The Register* was delayed owing to the over-carriage of much of the type to Hobart. Mrs. Robert Thomas, in her diary of those pioneer days, thus records the printing of the first document in South Australia:—

> We built a rush hut a short distance from our tents for the better accommodation of part of our family, but they had not long occupied it before everything was suddenly ordered to be cleared out to make room for the printing press, in order to print the Proclamation of the Colony [28 December 1836] and in this place (about 12 ft. square) the first printing in South Australia was produced.

Apparently the press was worked by Robert Thomas, although neither he nor his partner Stevenson had had any practical experience of printing. They continued to issue small official documents from the rush hut at Glenelg until the transference of the plant (1 June 1837) to town acre 56, in Hindley-street, which Thomas had purchased for £12 12s. Here, in a pisé hut, and mainly by the labours of the partners —skilled assistance being unobtainable, a young printer named Osborne having been lost while attempting to cross Kangaroo Island—the second number of the *South Australian Gazette and Register*, consisting of six pages of single demy, was printed. The ancient Stanhope press, on which was done the first printing in South Australia, is a treasured possession of the Thomas family, the present proprietors of *The Register*.

Queensland.—The first printing-press in Brisbane was erected in June 1846, 13 years before Queensland became a separate colony. Arthur Sydney Lyon arrived from Sydney and saw the need for a newspaper in the settlement, although at that time it consisted only of a few scattered houses. He wrote to James Swan, a printer employed at Sydney on the *Colonist*, and persuaded him to bring a small press and some type to Brisbane, and on 20 June 1846 the Moreton Bay *Courier* (the Brisbane *Courier* of to-day) was printed on it in a small garret of the North Star Hotel (afterwards known as the Australian Hotel) at the corner of two roadways which subsequently became Queen and Albert streets. The population of Brisbane and Ipswich was about 1500, and a facetious chronicler has left it on record that it included six lawyers, six doctors, six clergymen, and a dozen other educated persons.

Prisons. See POLICE.

Pritt, FRANCIS DRINKALL (1839-1903), born near Lancaster in England in 1839 and educated at the grammar school there and at Trinity College, Cambridge, was trained for the law, but at the expiration of his articles determined to devote himself to the ministry and was ordained by the bishop of Manchester. For 25 years he was engaged in parochial work in that diocese, but in 1889, at the age of 50, migrated to Queensland at the instigation of Bishop Webber and was appointed to North Rockhampton. In 1893, while on holiday, he visited the Melanesian islands and on his return to Queensland was asked by Bishop Barlow of North Queensland to establish a mission among the Melanesian kanakas working on the canefields. Settling on the Herbert River, he gave the rest of his life to this work; he was made archdeacon of Cairns, twice administered the diocese during the bishop's absence, and at the time of his death—on 11 February 1903—was in charge of the cathedral at Townsville.

G.W.

Production from Industries. See p. 338

Pronunciation. Certain names (of places, plants, animals, instruments, etc.) which are either peculiar to the Australasian region or especially identified with it, are liable to be mispronounced by those who meet with them only in print. Native words (Melanesian, Polynesian, etc.) have been for the most part—though not always, especially among the Australian languages—represented by linguists (including well-informed missionaries) in a manner phonetically true. As a consequence those who are accustomed only to the English unphonetic method are likely to assign wrong values to the symbols, especially to the vowels and dipthongs. Moreover, there is commonly nothing to show which syllable bears the accent, and—except with those who are to the manner born or have heard the names properly spoken—words like 'koala' and 'kanaka' (which should be accentuated on the second syllable), or 'waratah' (which should be accentuated on the first), are apt to suffer. A selection has therefore been made of such more-or-less important names mentioned in this Encyclopaedia as seem most likely to incur mispronunciation. These are given, together with their pronunciations, in an appendix to the present volume. Terms of scientific classification (botanical, zoological, etc.) in cosmopolitan use are not included, except one or two which have become the everyday names and are apt to be distorted by uninstructed speakers.

Prostanthera, a genus of the family Labiatae, comprising shrubs with opposite

P. lasianthos.

leaves and lilac or purple flowers (in spikes or solitary) many of which are strongly per-

Production from Industries. Official estimates of production expressed in pounds sterling (£), and of the relative purchasing power of money in the years mentioned, are here given graphically. The official computation of purchasing power is based on prices existing in 1911, and for comparison with other years the figures for that year (to the nearest £) are given in the first graph.

Market price of 1000 units of goods, in pounds sterling (£).

1906.—£1000

1911.—£1055

1914.—£1212

1924.—£1988

Amount purchasable for £1000 expressed in units of goods.

1906.—1000

1911.—948

1914.—825

1924.—503

Estimated value in pounds sterling (£) of the relative production in all Commonwealth industries for various years.

MANUFACTURING
(value added in process of manufacture).

1906.—£31,172,000

1914.—£59,004,000

1924-5.—£137,977,000

PASTORAL PRODUCTION

1906.—£45,389,000

1914.—£63,452,000

1924-5.—£121,891,000

AGRICULTURAL PRODUCTION

1906.—£25,349,000

1914.—£36,052,000

1924-5.—£107,096,000

DAIRY, POULTRY, BEE-FARMING.

1906.—£13,611,000

1914.—£22,504,000

1924-5.—£45,190,000

FORESTRY, and FISHERIES.

1906.—£4,879,000

1914.—£6,853,000

1924-5.—£12,357,000

MINING.

1906.—£26,643,000

1914.—£22,054,000

1924-5.—£24,646,000

TOTAL PRODUCTION (ALL INDUSTRIES).

1906.—£147,043,000

1914.—£209,919,000

1924-5.—£449,157,000

PRODUCTION PER HEAD OF POPULATION.

1906.—£35 18s. 9d.

1914.—£42 4s. 6d.

1924-5.—£76 9s. 5d.

fumed and highly ornamental. All the 50 species are endemic in Australia, mainly in the eastern areas. *P. lasianthos* (Mint-bush, in Victoria and Tasmania known as Christmas-bush) occasionally becomes a tree of 20-30 feet; in Britain, where it was introduced soon after its discovery, it is considered a highly ornamental shrub. It yields a greenish-yellow oil of mint-like odour and taste. The timber is hard and tough, and the young saplings are used for fishing-rods. *P. rotundifolia*, also an ornamental shrub, yields an essential oil of a darker colour, but otherwise resembling that of *P. lasianthos*. Both oils are carminative. *P. cineoifera* contains—as the name implies—a large amount of cineol. Certain species form masses of flowers—commonly known as 'Australian lilac'—to be seen on the slopes of Mount Wellington in Tasmania, Mount Macedon in Victoria, and Mount Wilson in New South Wales.

Proteaceae, an important family of shrubs or trees—rarely undershrubs or perennial herbs—chiefly represented in Australia and South Africa, but extending to New Caledonia, Malaysia, tropical Asia and Japan. A few genera also occur in South America. The calyx is obsolete; corolla of 4 petals, frequently cohering in a tube at the base, the segmented lobes usually becoming revolute as the flowers open; stamens

Persoonia lanceolata.

usually 4, inserted on the lobes of the corolla; fruit a compressed capsule, nut, drupe, or follicle; leaves entire, toothed, lobed, or deeply dissected, rigid and often spiny, harsh or leathery, flat or cylindrical. Third in numerical abundance in Australia, with no less than 667 species contained in 34 genera, the family is divided into two sub-families: (1) Nucamentaceae, in which the flowers are solitary and the fruit a nut, or drupe (dry or succulent), falling without liberating the seeds; *Isopogon*, *Petrophila*, *Conospermum*, and other genera have dry nuts; *Persoonia* has a succulent drupe: (2) Follicares, flowers usually in pairs, fruits either a follicle or a 2-valved capsule, the fruit liberating the seeds while still attached to the plant. *Grevillea*, *Telopea*, and *Lomatia* are typical follicle-bearing genera; the banksias have 2-valved, capsular fruits. Many species occur in regions with a low rainfall, and the shape and texture of their leaves, together with the thick cuticle layer, are adapted to withstand severe drought conditions. The name suggests how variable in form and habit are the members of the family.

The flowers are as a rule brilliantly coloured and conspicuous, and, like the foliage, often bizarre in appearance. Few species are of economic value, except some of the trees for their ornamental wood. They are favourite garden-plants, but not readily amenable to cultivation.

See ADENANTHOS, BANKSIA, CONOSPERMUM, DRYANDRA, GEEBUNGS, GREVILLEA, HAKEA, HICKSBEACHIA, ISOPOGON, LAMBERTIA, LOMATIA, MACADAMIA, ORITES, PETROPHILA, STERNOCARPUS, STIRLINGIA, SYMPHYONEMA, XYLOMELUM, WARATAH.

Protection. See TARIFFS and NEW PROTECTION.

Prout, JOHN SKINNER (1806-1876), born at Plymouth, England, in 1806, was a nephew of Samuel Prout the well-known water-colour painter and friend of John Ruskin. An artist like his uncle, but mainly self-taught, he published in England books illustrating ancient buildings in Chester and in Monmouthshire, and in 1840 migrated to Sydney, where he made a living by any kind of work to which his art could be applied. In 1842 he was painting scenery for the Olympic Theatre; in 1844 he published in Hobart ten plates of Tasmanian views, in London a short journal of his outward voyage in an emigrant ship (with descriptions of Sydney and Port Phillip), and in Sydney nine plates in a volume called *Sydney Illustrated*. Returning to England in 1850, he exhibited his Australian pictures at the Great Exhibition of 1851, and began to utilize his experiences for the illustration of books relating to Australia—especially guide-books to the goldfields, which he had never seen. He settled at first in Bristol and later on in London, became a member of the Institute of Painters in Water-colours, and as late as 1874 helped to illustrate E. C. Booth's *Australia*. He died at Camden Town, London, on 29 August 1876. See ART.

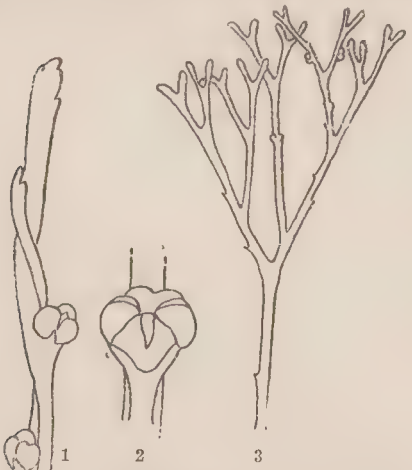
Pseudo-scorpions (false scorpions), the popular name for arachnids of the order Pseudoscorpionida (Chernetidea). Superficially they resemble scorpions in the size and form of the pedipalps; but the abdomen does not end in a post-abdomen, and a caudal sting is absent. They are all small in size, and are flattened dorso-ventrally, the cephalothorax and abdomen being broadly joined together. The cephalothorax may be segmented by one or two grooves, or may be unsegmented. The broad abdomen is usually composed of 12 segments, of which 11 alone are visible. They have only one or two pairs of eyes, situated on the lateral borders at the anterior end of the cephalothorax. The chelicerae are variable in structure, and provide characters important for classification. The movable fingers of the chelicerae bear on their inner margins comb-like organs (serrulae). A delicate structure, the flagellum, is also attached to the first segment of the chelicerae.

Pseudo-scorpions possess spinning-organs which open on the chelicerae; the silk is used for the manufacture of a cocoon or retreat, into which the animal retires during moulting, for hibernation, or during the breeding-season. They live under the bark of trees, not uncommonly under that of eucalypts, or in vegetable debris; one species occurs in books. Their small size renders them inconspicuous, and probably for this reason they have escaped the attention of collectors; for, though they are known to occur most abundantly in warm climates, only a dozen species have been recorded from this continent as against the 20 species known from Britain.

The order has been divided into two sub-orders. In the Panctenodactyli the serrula of the movable finger of the chelicera is attached throughout its length. Three families are included in this sub-order, of which two are represented in Australia, the Garypidae and the Cheliferidae. The last-named family includes the genus *Chelifer*, in which are placed the great majority of the Australian pseudo-scorpions. Only two species are included in the Garypidae, *Olpium michaelseni* from Western Australia, and *Garypus hanseni* from Tasmania. In the second sub-order, Hemictenodactyli, the serrula is attached proximally, and is free distally. Two families are included in the order, but only one, the Chthoniidae, is represented, and that by a single species *Chthonius caecus*, described by Tullgren from Western Australia.

See Keyserling in Koch's *Die Arachniden Australiens* (1885), the *Cambridge Natural History* (1909), and Tullgren's *Die Fauna Südwest-Australiens* (vol. ii, 1909). A.M.

Psilotaceae, the only living family of the class Sphenophyllales of vascular cryptogams, closely related to the ferns (q.v.). It contains two genera, *Psilotum* and *Tmesipteris*. *Psilotum* has delicate angular, forking stems, bearing leaves that are reduced to very small scales; its 3-chambered sporangia are borne on leaves still more reduced. The common species, *P. rudum* (*P. triquetrum*), has a wide tropical range, and has been recorded from Queensland, New South Wales, and Victoria; Domin's variety *fallacinum*, from northern Queensland, is a very delicate plant. *P. complanatum* and its variety *flaccidum* are also found in northern Queensland. These plants are as a rule epiphytic, but have been found in soil that is rich in humus. *Tmesipteris* is always epiphytic, usually on tree-ferns. It has long trailing stems with conspicuous pointed leaves; the non-fertile leaves are simple, the fertile fork like a V, and have the 2-chambered sporangia inserted on their upper surface at the angle of the V. *T. tannensis* occurs frequently on the Blue Mountains of New South Wales, and is also found in Queensland, Victoria, and Tasmania. Until recently nothing was known of the mode in which these plants propagated, but in 1916 Thomas Whitelegge announced his discovery of both male and female gametophytes.



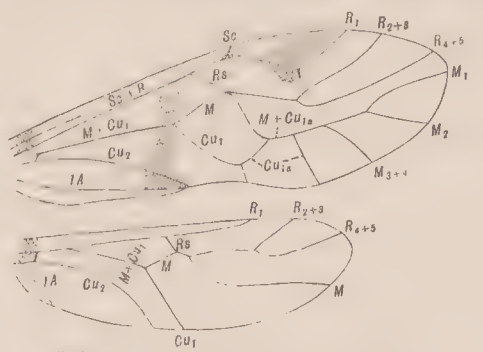
(1) Branch with 2 mature synangia slightly enlarged. (2) A single opened synangium showing the 2 lobes of the sporophyll below it. (3) Part of a vigorous plant of *Psilotum triquetrum*.

See *Proceedings* of the Linnean Society of New South Wales, 1916, part iii. W.W.W.

Psittacidae. See PARROTS.

Psocoptera, an order of insects (also known as Copeognatha) comprising a group of small forms known as psocids or book-lice, which are easily distinguished by the simple and unique wing-venation, the generalized structure of the head sclerites, the presence of paragnaths in the mouth-parts, and the development of a chitinous chisel or pick from the maxillae. About 30 Australian species have been described—mostly by McLachlan and Enderlein—and a considerable number await description. In spite of their vernacular name, most of them do not infest books; the only species with that habit, and the only wingless species found in Australia, are the introduced *Atropos pulsatoria* and *Troctes divinatorius* (Book-lice or Cabinet-mites), which are serious pests in libraries and museums. Most Australian species are found either running about on the bark of trees or resting on the leaves.

The order is divided into two sub-orders, depending on the number of joints in the tarsi. In the sub-order Trimera (which includes all the families except two) the tarsi have three joints. The Myopsocidae include many prettily coloured psocids, of which the dark mottled-brown *Myopsocus australis* is the best-known; it is frequently found resting near water. Other beautiful species belong to the genera *Pentacladus* and *Tricladus*, which inhabit the leaves of eucalypts. There are also a few species in which the wings, though present, are imperfectly developed in one or both sexes.



Wings of *Clematostigma maculiceps*.

In the sub-order Dimera the tarsi have only two joints. This sub-order contains the two dominant families Caeciliidae, in which Cu_1 and M remain separate in the fore-wing, or are only

connected by a cross-vein, and Psocidae, in which these two veins are fused for a space. The Caeciliidae consist mostly of very small forms with delicate gauzy wings, some very prettily marked. Of seven genera found in Australia *Cladioneura* is probably the most striking. *Cl. pulcherrima* has been taken both in Western Australia and in New South Wales. Of the Psocidae, six Australian genera are known, including *Psocus* itself and the closely allied *Clematostigma*, both represented by some handsome species of moderate size. Our largest species is *Amphigerontia formosa* (formerly known as *A. illidgei*), shown on plate xix, fig. 6. It measures over 1½in. in expanse, and is found in the neighbourhood of Brisbane.

See Enderlein's *Die Copeognathen des Indo-Australischen Faunengebietes* (1903), and other works of the same author. R.J.T.

Psoralea, a genus of the family Leguminosae, consisting of herbs or shrubs with leaves divided into three or more leaflets, frequently dotted with black glands, widely distributed, and most abundant in South Africa and North America. The flowers are pink, purple, blue, or white, in narrow spikes on a long stem; pods small, oval, often black, falling off with the seeds enclosed. *P. tenax* is a useful fodder-plant. *P. Archeri*, the 'wommo' of the Cloncurry River natives, is used by them in making cordage. All the species are more or less useful fodder-plants.

Public Debt. The public debt of Australia includes (*a*) sums borrowed by the Commonwealth; (*b*) debts—e.g. of the Northern Territory—taken over by the Commonwealth from the States; (*c*) sums borrowed by the States either before or since federation. From some points of view the debts of Australian municipalities and other local bodies might also be called 'public;' these will be referred to later. At the present time the principal forms of security used for raising Government loans in Australia are inscribed stock and debentures. In some cases the whole loan is raised by means of debentures; in others the borrower has the option of taking inscribed stock or debentures as he pleases, and in certain cases of subsequently converting from one form to the other. In addition to these forms there are treasury bills, which in Australia are usually (though not invariably) short-term debentures; and the war produced two new forms of security, war savings certificates, and war savings stamps, the latter being convertible into the former in specified amounts. Until the outbreak of war in 1914 most of the public debt had been contracted for the construction of public works of various kinds, principally railways and tramways. Later, the heaviest flotations were applied to financing war expenditure. At no time has the raising of loans to cover revenue deficits occupied an important place in Australian loan finance, though such practices are by no means unknown in some States.

The public debt of the Commonwealth may in a sense be said to have originated when six colonies handed over their departments of trade and customs, and the Commonwealth assumed liability for the properties taken over. With the transfer of the postal, defence, and other departments this liability was increased, and on 30 June 1925, the total outstanding liability in this regard was £10,858,093. Owing to the arrangements of the Braddon clause (q.v.), the need to pay interest on this liability did not arise for ten years; then, however, the Commonwealth began to pay interest to the States on the value of the 'transferred properties' as at that date. This being taken as a starting-point, the following table shows the effect of the war on Commonwealth finance:—

Commonwealth Public Debt, 1911 to 1925

Date.	Amount.	Per head of population.
		£ s. d.
30 June 1911 ...	£15,580,771 ...	3 9 5
" " 1925 ...	£430,947,592 ...	72 13 8

The items of debt on 30 June 1925 were as follows:—

Loans taken over from States in respect of—		
Transferred properties	£10,858,093	
Northern Territory ..	1,192,419	
Oodnadatta railway ..	1,077,678	
		£13,128,190
Loans raised on behalf of various States		68,866,418
War debt—		
Raised in Australia ..	£223,032,269	
Gratuities to returned soldiers (overdue) ..	64,452	
Indebtedness to British government under funding arrangements act of 1921	88,097,605	
		311,194,326
Borrowed for public works, etc.		37,758,658
Total		£430,947,592

Leaving out of account the sums borrowed on behalf of the States, which will be repaid by them, 86 per cent of the Commonwealth debt is due to the war. Of the total amount the sum of £273,972,477 was raised in Australia, and £146,117,022 in London; the liability on account of transferred properties cannot be allocated. The major portion of the debt is repayable at specific dates ranging from 1925 to 1972, but a small sum has no definite date of maturity. The years in which the largest amounts fall due are:—1927, £89,990,387; and 1930, £73,708,100.

In July 1925 the Commonwealth floated a loan (largely for conversion purposes) in New York and London. The New York portion consists of 5 per cent 30-year gold bonds for $75,000,000 at 99½. This is the first occasion on which the Commonwealth government has floated a loan outside the British Empire. The London issue was a 5 per cent loan, 1945-75, for £5,000,000 at 99½.

The earliest instance of government borrowing in Australia was a loan raised by New South Wales in 1842; the same colony's application for a five per cent loan in 1855 marks the earliest appearance of an Australian government on the London market. The earliest recorded borrowings on the part of the governments of the other colonies are as follows:—Western Australia, 1845; Victoria and South Australia, 1854; Queensland, 1861; Tasmania, 1867. From small beginnings the debts have gradually grown until on 30 June 1925 the aggregate indebtedness of the States was £603,334,254. In all cases some provision is made for sinking funds, but in New South Wales and Queensland the accumulated amounts are small. The total amount of all the State sinking funds on 30 June 1925 was £18,630,951. The gross public debt of each State, and the cor-

responding amount per head of population, on the same date are as follows:—

State.	Amount.	Per head of population.
		£ s. d.
New South Wales	£215,331,110	94 10 6
Victoria	128,445,565	74 8 7
Queensland	96,389,067	111 8 3
South Australia	74,780,835	135 7 0
Western Australia ..	64,493,261	147 11 5
Tasmania	23,894,416	106 2 5
All States	£603,334,254	98 12 3

The growth of the State public debts since 1901, both in aggregate amount and also in amount per head of population, is shown in the following table:—

Date.	Amount.	Per head of population.
		£ s. d.
30 June 1901 ..	£203,518,275 ..	53 14 6
„ „ 1906 ..	238,427,820 ..	58 14 10
„ „ 1911 ..	261,229,887 ..	58 4 2
„ „ 1916 ..	363,373,549 ..	73 10 0
„ „ 1921 ..	474,847,459 ..	87 0 10
„ „ 1924 ..	595,364,487 ..	102 11 9
„ „ 1925 ..	603,334,254 ..	98 12 3

Statistics of the aggregate loan expenditure to the end of each financial year are published regularly by the State treasurers; but they are not compiled on a uniform basis, and it is impossible to state exactly the purposes for which the loans were obtained. These figures, however, furnish a basis for an approximate distribution, and indicate the following rough proportions:—

	per cent
Construction and equipment of railways and tramways	49.13
Water-supply and sewerage	14.26
Land purchases for settlement, and advances to settlers	12.68
Harbours, rivers, lighthouses, roads, and bridges	9.17
Public buildings	3.40
Telegraphs and telephones	0.70
Defence	0.43
All other purposes	10.23

Rates of interest have varied very considerably. Starting at five and six per cent, they gradually declined until a large amount of debt was contracted at as low a rate as three per cent. The upward turn in interest rates, which took place in or about 1897, had its effect upon State borrowing, and rates for new loans have been increasingly higher, until in 1921 a Queensland loan was floated at seven per cent, and a Tasmanian loan at 7½. These exceptionally high rates were due to the effects of the war; but there is little doubt that the interest level, when times are again normal, will be higher than in pre-war days. On 30 June 1925 the amount of State debt at different rates was as follows:—

Rates of interest.	Amount of State debt.
Under 4 per cent	£125,746,000
4 per cent and under 5 per cent	118,029,000
5 per cent and under 6 per cent	259,394,000
6 per cent and over	100,165,000
Total	£603,334,000

The average rate of interest payable on the whole of the State debts (as on 30 June 1924) was £4 14s. 4d. as compared with £3 11s. 5d. in 1911, and £3 13s. 8d. in 1901. The fall from 1901 to 1911 was due to the gradual maturing of securities at high rates, which more than balanced the effect of the general rise in rates that operated in respect of new issues. The increase now in evidence will probably continue for a considerable time, since loans made at the lower rates have to be renewed at a marked advance. The maturity dates of the debt outstanding on 30 June 1924 ranged from 1924 to 1970, as shown in the following table:—

Due dates.	Amount.
	£
Overdue	23,543
1924-30	203,445,235
1931-40	154,956,363
1941-50	138,058,235
1951-60	38,827,383
1961-70	23,066,000
Indefinite	7,406,359
Interminable	2,672,271
Terminable at government option ..	18,016,887
Annual drawings	102,432
Half-yearly drawings	8,789,779
Total	£595,364,487

The loans transferred from, or contracted on behalf of, the States are included in both Commonwealth and State debts. Making allowance for these, the total Australian public debt on 30 June 1925 amounted to:—

Commonwealth debt	£430,947,592
State debts	603,334,254
	1,034,281,846
Deduction for debts counted twice	43,980,000
Net public debt	990,301,846

or about £175 per head of the population.

Transfer of State Debts.—In pre-federal days one of the advantages urged in favour of federation was that there would be an opportunity of placing the indebtedness of Australia on a more satisfactory basis by the transference of debt-liabilities to the proposed federal authority. It was also contended that the transfer to the Commonwealth of the large revenues from customs and excise should be accompanied by a corresponding transfer of liabilities, to prevent the federal authority from unwarranted extravagance in its expenditure. On the other hand, it was feared that if the federal government were made responsible for the debts of Australia, the liability so imposed would be used as an excuse for establishing a markedly protectionist tariff. The outcome was that, both in the constitution bill of 1891 and in the Commonwealth constitution as eventually passed, the taking over of State debts was left to the option of the federal parliament. But, whereas the 1891 bill insisted on the 'consent of the parliaments of all the States' before the federal parliament could legislate in the matter, the constitution as finally passed gave the federal parliament absolute power by decreeing that 'The parliament may take over from the States their public debts as existing at the establishment of the Commonwealth, or a proportion thereof according to the respective numbers of their people.'

The federal parliament had thus the choice of two alternatives; it might either take over the whole of the State debts as on 31 December 1900, or, if unwilling to take the whole, must (if it acted at all) take from each State the same amount of debt per head of its population.

Various proposals for the transfer of State debts were considered at premiers' conferences and elsewhere in the years succeeding federation,

but the federal parliament exercised neither of its options. In the meantime the State debts had been growing rapidly, and it was soon felt that a transfer of the debts existing on 31 December 1900 would be inadequate. An amendment of the constitution, providing for the deletion of the words 'as existing at the establishment of the Commonwealth,' was accordingly submitted to a referendum, approved, and brought into effect by statute on 6 August 1910; this had the effect of considerably enlarging one of the options, but up to the present time (1926) no action has been taken on this basis.

In all the States the larger municipalities have contracted loans, usually for the construction of works and buildings; in most cases there has also been borrowing by water-supply and sewerage boards, harbour trusts, tramway boards, etc. The statistics of this indebtedness are unfortunately not in a satisfactory condition—even where the total is known, it is not always readily ascertainable whether the amount indicated is an advance from a State government (and hence already included under the head of State debts) or a separate loan. As far as can be readily ascertained, the total sum so involved, exclusive of loans from State governments, is approximately £40,000,000. Thus the federal, State, and local-government debts of Australia, as on 30 June 1925, amount to a total of over £1,000,000,000.

C.H.W.

Public Health. The care of public health in the Australian States is for the most part vested in local authorities, who administer public health acts under the supervision of a central authority in each State. Within municipalities the municipal council, within shires the shire council, is the local authority. The constitution of the central authority is not uniform throughout the Commonwealth. In some States control is exercised by a central board (or commission) of health, consisting partly of prominent medical practitioners and partly of laymen; in others it is vested in a chief health officer (or commissioner) appointed and paid by the government, who must be a medical practitioner. In every State there is also a minister of public health, who occupies a seat in the cabinet and is responsible to parliament for his department.

The functions of the Commonwealth in this sphere are mainly confined to the administration of quarantine and the control of the Australian Institute of Tropical Medicine and the Commonwealth serum laboratories (see TROPICAL MEDICINE); its minor activities are fully set out in the *Official Year Book* under 'Public Hygiene.' Quarantine stations exist in each State to deal with all incoming passengers, animals, or plants; in five States they are under the control of a federal official, but in Tasmania the chief health officer of the State acts for the Commonwealth. The Northern Territory is administered from Queensland. Animal and plant quarantine is administered by State officials under Commonwealth direction. The quarantinable diseases are smallpox, plague, cholera, yellow fever, typhus fever, and leprosy; others may be added to the list by proclamation. Vessels arriving from Europe or America are examined only at the first port of call, those from Asia at the first and last ports. Owing to Australia's geographical isolation quarantine is more effective than in most other countries.

The basis of public health control in each State is an act framed, more or less roughly, upon the model of the English public health act of 1875, but varying widely from the model in many directions to meet the special needs of a young and sparsely-populated country. Further, many useful provisions for safeguarding the public health are to be found in other acts; and there is a strong tendency to control sanitation by by-laws and regulations which, owing to their flexibility, are specially adapted for this purpose.

The executive personnel of the public health services consists of medical officers of health and sanitary inspectors; their exact designations vary slightly in different States, but their duties are best indicated by the above titles. Local authorities appoint sanitary inspectors. In the more important municipalities there is an increasing tendency to demand in the appointee some qualification for his duties. A sanitary inspector's diploma of the Royal Sanitary Institute of London is a favourite qualification; nearly 500 sanitary inspectors in Australia have already acquired it, after training and examination, from local committees of the institute which have been established in all the States.

Control of the more common infectious diseases is everywhere remitted to local authorities. Notification of cases must be made to the local authorities, and by them transmitted to the central authority. The list of notifiable diseases differs in different States, but in all diphtheria, typhoid fever, scarlet fever, infantile paralysis, cerebro-spinal fever, venereal diseases, and pulmonary tuberculosis are notifiable. Most States differentiate between the commoner infectious diseases and those of a more serious and exotic nature, which are classed as 'dangerous' infectious diseases; they include smallpox, cholera, yellow fever, leprosy, and bubonic plague. Control of this class is retained by the central authority. Disinfection of infected dwellings and goods is performed by local authorities in the case of the ordinary infectious diseases, and by the central authority in the case of the dangerous infectious diseases. Children from infected houses must not attend school, and sufferers must not visit public places or travel in public conveyances to the risk of the public.

Certain persons, though not themselves betraying any symptoms of an infectious disease, may carry the germs of such a disease on or in their persons, and may infect others with the disease in a virulent form; these 'carriers' may become very dangerous to the public, and 'carriers' of typhoid fever, diphtheria, and cerebro-spinal meningitis are known to be not uncommon. Several States have enacted legislation providing for their examination, suitable isolation, and treatment with the object of minimizing the risk of their infecting other persons.

Vaccination is legally compulsory in four States, but in all except Victoria the law is practically a dead letter; in New South Wales and South Australia there is no law requiring vaccination. It is interesting to note that in 1913 an extraordinarily mild strain of smallpox was introduced into New South Wales from Canada, and was rarely fatal—among 2000 cases known to have occurred, there were but four deaths. The more virulent type of smallpox has invaded Australia on many occasions, but energetic measures of isolation and vaccination have always been successful in rapidly limiting these invasions.

Bubonic plague has twice invaded Australia, first in 1900, the disease not being finally got rid of till nine years later; the second invasion

was in 1921. The brunt of both invasions was borne by the north-eastern States, Queensland and New South Wales. The others either escaped entirely or had only a few cases. The reasons for this relative or complete immunity are possibly to be sought in the distribution of the Indian rat-flea, which conveys plague from the rat to man. It is very susceptible to climatic influences, and seems to be relatively rare in the southern States.

Dengue, malaria, and filarial disease are not uncommon in Queensland; all are transmitted by the bites of different varieties of mosquito, and their localized prevalence is closely related to the geographical distribution of the mosquito implicated. Dengue, which was probably introduced into Australia about 1885, has from time to time occasioned extensive epidemics in Queensland, and has sometimes spread to the northern coastal districts of New South Wales; in the summer of 1925-6, however, the invasion was more serious, many of the northern and north-western districts of the State being involved, as well as the valley of the Hunter River down to its mouth. The mosquito (*Stegomyia fasciata*, also called *Aedes aegypti*) responsible for transmitting this infection is common in Queensland (where it extends inland as far as Cunnamulla), and is found in New South Wales as far south as the latitude of Newcastle, both on the coast and inland. It bites by day as well as by night. It is a house-frequenting species, and lays its eggs in any available receptacle of water, from the rain-water tank down to the bedroom jug and the water-traps that are placed round table-legs to intercept ants. Ten days after the eggs are laid they have developed into adult mosquitoes, provided the water has not been disturbed. The chief precaution, therefore, against dengue fever lies in the covering of all water-tanks with wire gauze and continual replenishment of even the smallest water-receptacle with fresh water and its frequent cleansing; the exclusion of the mosquito from houses by means of wire gauze is a valuable but secondary precaution. See TROPICAL MEDICINE.

Australia's pure food legislation is probably the most advanced in the world, and is enforced with a fair degree of thoroughness in all the States. Adulteration or any sophistication of food, fraudulent or misleading labelling, and unclean or dangerous methods of preparation, are visited with severe penalties. Standards have been set up for most of the commoner articles of food, and no departure from them is allowed. Pure food legislation in all the States is approximately uniform, and is largely carried out by regulations. The special problems of the conveyance of disease through infected meat and milk are met in all the States by elaborate regulations for the control of slaughter-houses and dairies, and by the maintenance of trained staffs of inspectors. Regulations controlling the milk-supply have been 'tightened up' considerably during the past 20 years, and adulteration has diminished correspondingly, but too much dirty milk is still sold, and it has become a question whether a bacterial standard of purity should not be enforced. Investigations now being carried out in the biological laboratory of the New South Wales department of health indicate that tubercle is very rare in Sydney milk.

The installation of public water-supplies has been effected in all the State capitals and many of the larger country towns; in the smaller towns, and for isolated dwellings, water collected from iron roofs and stored in iron tanks is the general source of supply. Excellent sewerage-systems are found in most capitals and many of their suburbs, and in a few of the larger towns, but in most country towns conservancy methods of dealing with excremental waste are employed. Septic tanks and other biological methods of treating sewage are also being increasingly used. Typhoid fever and other bowel complaints are always more prevalent in unsewered towns than in those which possess sewerage-systems. The disposal of dirty house-water (sullage) is difficult in communities which have no sewer facilities. If the soil is absorbent in character, dwellings surrounded by small allotments of land can generally dispose of their sullage water by subsoil irrigation. If the contour of the town-site is undulating, local authorities sometimes wink at the discharge of sullage water into street gutters, but this is usually prohibited. The dry refuse of houses (generally known as garbage) is, in nearly all Australian communities, collected by the local authorities, and buried in waste ground outside the populous localities. The capital cities of most States, and a very few of the larger country towns, have established incinerators for disposing of this class of refuse by combustion.

The housing question in Australia has not the same overwhelming importance as in Europe. The mildness of the climate and the greater amount of sunshine favour an open-air life, and there is less grinding poverty (which is after all the main reason for bad housing). Nevertheless there is too much overcrowding in the older cities, particularly in their industrial districts, and such conditions react adversely upon health generally, and particularly upon that of infants.

The prevention of nuisances (which includes the control of noxious trades) is everywhere one of the important duties of the local authorities.

Infant Welfare.—The infant death-rate is one of the most sensitive indications we possess of the physical welfare of a nation, and of the effects of sanitary conditions. In Australia there has been a very marked decline in infant mortality during the present century; in 1901, for every thousand children born, 110 died within the first 12 months of life, but by 1925 the rate had steadily fallen to 53 per thousand births. This decline, though general, has been most marked in the large cities. Sydney was the first Australian city to adopt definite measures for the reduction of infant mortality. Early in 1904 trained-nurse inspectors were appointed as 'infant-visitors,' to visit new-born children, advise the mothers, and advocate, above all, the overwhelming importance of breast-feeding. Within ten years the proportion of wholly breast-fed children had increased from 72 to 93 per cent, and the infant-mortality rate fell year by year. In 1914 the Sydney staff of infant-visitors had expanded into an establishment of child-welfare centres, which are now rapidly permeating New South Wales. Victoria followed suit in 1917, and by 1925 most of the States had established similar organizations. Other measures include improvements in city milk-supplies, attention to domestic and municipal cleanliness, and effective control of midwifery.

In spite of the vigorous efforts which have been made during the past 20 years in most civilized countries to lower infant mortality, and the signal success which has often been achieved, these efforts have everywhere failed to lower appreciably the mortality of infants in the first month of life. Australia furnishes no exception to this rule.

Maternity.—The average number of mothers dying annually from causes connected with child-birth is rather high in Australia, compared with some other countries. Most of the States possess machinery for the registration of midwives, and for the exercise of some control over their conduct. All the State capital cities have excellent maternity hospitals; in the country districts a few hospitals have made provision for maternity cases, but the majority are deficient in this respect. Prospective mothers in isolated farms and small bush homesteads who wish to escape undesirable conditions should be able to reach a public hospital with proper facilities and staffing, but at present private maternity hospitals (which are found in most country towns) usually represent the only provision for this class of case.

School-children.—Every State has made provision for the medical supervision of school-children, and in New South Wales in particular medical examination is general. The supervision in this State, to which that in all the States more or less closely approximates, includes (1) regular medical inspection of all school-children, (2) investigation of school epidemics, (3) the delivery of systematic courses of lectures on medical subjects at teachers' training-colleges, (4) the treatment of ophthalmia among children in outlying districts, (5) visitation of the parents of defective children by trained nurses, (6) propaganda work in hygiene by means of 'talks,' books, pamphlets and periodicals, and (7) dental treatment. Travelling hospital and dental clinics have been established to deal with outlying districts where there are no resident doctors or dentists.

Industrial Hygiene.—All the States have long possessed acts providing for factory inspection and the regulation of ventilation, illumination, the employment of young persons, and cognate matters. In New South Wales a special branch of the public health department has been placed under a medical expert in industrial hygiene, and its work has proved valuable. The Commonwealth health department has also established an industrial division under a specially qualified medical officer, which has devoted its energies chiefly to the compilation of statistics dealing with industrial disease, and to the issue of monographs and other publications; it has also been associated in several States with important investigations into diseases produced by dust among miners of quartz and metals.

Research.—Since medical methods nowadays depend more and more upon the laboratory for diagnosis and treatment, Queensland, New South Wales, and Western Australia have established biological laboratories in connection with their public health departments; the other States get their bacteriological work done for them by arrangement with a university or hospital laboratory. The Commonwealth serum laboratories in Victoria manufacture sera and vaccines on a large scale, and supply them to medical practitioners and others throughout Australia. The Australian institute of tropical medicine in northern Queensland (see TROPICAL MEDICINE) concerns itself chiefly with research into important questions of tropical hygiene. Health laboratories are maintained by the Commonwealth at Bendigo in Victoria, Lismore in New South Wales, Townsville, Rockhampton, and Toowoomba in Queensland, Port Pirie in South Australia, Kalgoorlie in Western Australia, and Rabaul in the Mandated Territory.

Treatment of Disease.—The principal factor in the treatment of disease is the hospital. Australia is fairly well supplied with public hospitals (q.v.); the latest available returns show that the proportion of hospital beds to population is 3.2 per 1000 persons. Provision for infectious cases is made both in the State capitals and in the country districts. Each capital has its infectious-diseases hospital, and most country hospitals are provided with infectious-diseases wards. In several States bush nursing associations have been formed to provide nurses for isolated districts that lack doctors and hospitals. These associations receive government subsidies.

The hospital system in Australia suffers from lack of organization. The State governments defray about half the expenditure on hospitals, yet retain little effective control over the institutions, the affairs of which are managed by boards or committees elected (in most of the States) on a rather illogical suffrage. The enthusiasm of residents and the employment of political influence has not infrequently secured the erection of hospitals in districts where there was no real need for them, while in other districts there is a shortage.

A campaign against hookworm disease is now proceeding in Queensland, Papua, and the north coast of New South Wales. The Rockefeller international health board, the Commonwealth, and the affected States have combined in this campaign under Commonwealth co-ordination and under the direction of medical experts lent by the Rockefeller Institute. Cases of the disease are being ferreted out, and many thousands of victims have already been cured.

Since 1900 a great advance has been made in several directions, especially in the improvement of the sanitary environment and in the reduction of the burden of infectious diseases. The general death-rate of Australia has fallen 25 per cent between 1901 and 1925—from 12.22 to 9.20 per 1000 of the population—which means a saving of 18,000 lives every year on the present population. The mortality from tuberculosis has diminished by half, from 11 to nearly 6 per 10,000; that from diphtheria and croup has decreased 52 per cent, and from typhoid fever 86 per cent. Infant mortality during the same period has fallen 47 per cent, and in the great cities (where the bulk of the improvement has taken place) the fall has been even greater. Unhappily a similar improvment is not evident in some other directions. Measles, influenza, and pneumonia are still prevalent, and cause a heavy mortality; cancer is definitely increasing. Venereal disease causes much mortality and still more disablement and misery. The effect of recent legislation against it is not yet very apparent, and in most of the States the existing legislation for the compulsory notification of venereal diseases is not satisfactory owing to its inherent difficulties. On the other hand, the provision of free treatment for venereal diseases in subsidized hospitals and specially established clinics, and the educational and publicity campaigns carried out by the health departments, have been undoubtedly beneficial. W.G.A.

Puffers. See TOADOES.

Pugilism. Fights under English prize-ring rules were no doubt plentiful in Australia at very early dates, but the first recorded battle is that in which John Berringer defeated Charles Lifton on 7 January 1814. It took place at the Sydney race-course (now known as Hyde Park). The contestants were required to run

half a mile before fighting. At the end of 56 rounds (occupying two hours) Berringer was declared winner. Under present-day rules (three-minute rounds, one-minute spells) the fight would have taken 3¾ hours. For the next 70 years prize-fighting (though an offence against the law of the land) was freely indulged in, and contests for large stakes were frequent. As early as 28 May 1827, when Logan beat Young Bailey at Parramatta, there was a side-wager of £500 on the result, and contests for £100 a side were numerous.

On 20 February 1824 took place a fight that caused great excitement in the colony, 'Young Kable' of Windsor knocking out a visiting English pugilist, Clark, within ten minutes. Kable was the first Australian-born boxer to achieve such success, and Sydney waxed enthusiastic over the victory of the 'currency lad.' In the thirties Parramatta and Windsor were favourite ring-sites; important events were also on occasion decided at Surry Hills and the quarantine grounds. The chief fighters of the time were Ned Chalker, Kable, Bailey, and George Hough. Early in 1843 Hough defeated Bailey for £200 a side at Como on George's River. In 1846 Bill Sparkes—who in four successive contests had defeated Charles Wooten, Joseph Marshall, Bill Davis, and 'Tom the brewer,' and had thus acquired the title of Australian champion—determined to try his luck in the English ring. He reached England early in 1847, and soon proved to the well-known fighter Johnny Broom that he was worth befriending. Broom, indeed, thought so highly of him as to arrange a match with Nat Langham, whose record of successes was at the time unbroken, and who afterwards was the only man to defeat Tom Sayers. On 4 May 1847 they met. In the 36th round Sparkes delivered so heavy a blow that Langham was lifted off his feet and dropped heavily. In the subsequent rounds Langham repeatedly went down to save himself either from blows to the body or from being wrestled down by his more powerful opponent; in the 62nd round, however, Sparkes managed to throw him before he could drop without receiving a blow (a breach of rules that in these days would have disqualified him). In throwing him Sparkes broke his own right arm, but insisted on fighting on until the 67th round, when Broom entered the ring and threw up his hat as a token of surrender. Even then Sparkes was anxious to continue the fight.

In Australia the next important fight was that between George Hough—who after the departure of Sparkes secured the championship—and 'Black Perry.' Perry was a huge negro convict whose crime had been the passing of counterfeit one-pound notes, but it was generally understood that he had been merely a scapegoat in the affair. He met Hough on 10 December 1849 for £100 a side, and defeated him in 5½ minutes. Thenceforth Perry was regarded as invincible, and could find no opponents; unable, therefore, to earn a living by boxing, he sank into drunkenness and was found dead one night on a Sydney door-step.

During the 1850s new fighters appeared. 'Paddy' Sinclair took only seven rounds to account for the now ageing Sparkes. The rapidly increasing population of Victoria produced James Kelly, who in November 1855 fought with Jonathan Smith at Fiery Creek near Daylesford a drawn match that lasted 6¼ hours—still the longest fight on record. Kelly was one of a family of famous fighters, two descendants of whom, Thomas and Charles, are still living.

Early in the seventies Larry Foley became prominent. In 1871 he attracted attention by defeating Sandy Ross at Como after a bitter fight of two hours. Foley was only 5 feet 8 inches in height and 10 stone 7 lb. in weight—a welter-weight—but he fought and defeated opponents of all sizes, and was never defeated in a fight with the naked hands. During the 1870s he beat Ross (twice), 'Stonewall' Jackson (a heavy-weight), Charles Keeley, Hughes, Hogan, Johnson (another heavy-weight), Dick Briley, Ben Woods, Fagan, and Corbitt, and on 20 March 1879 wound up his fighting career by defeating the hitherto unbeaten Abe Hicken for the Australian championship and £500 a side. He did not depend on fighting for a living, as he was licensee of several hotels at different times. After defeating Hicken he devoted himself mainly to training young boxers, and among others turned out those sterling fighters Peter Jackson, Paddy Slavin, and 'Griffo.' In April 1884 a fight at Kensington between Jimmy Lawson (an American negro) and the Victorian Alick Ager ended in Ager's death. Lawson was imprisoned for six months, and prize-fighting with naked fists came to an end—a result towards which much had been done by the Englishman Jem Mace, who visited Australia in 1877. In 1883 'short-distance' matches were frequently decided in the parlour of the White Horse hotel, while Foley was the licensee. Owing to the popularity of the sport the ring was shifted to the cellar, which was more commodious. The fighting-space of this ring was made of cement, padding was considered unnecessary, and wrestling matches took place in it without mats. The first fight in it, between the English light-weight Jack Hall and 'Paddy' Moran, a pupil of Peter Jackson's, ended because Moran's head hit the cement so hard as to incapacitate him for further fighting. Efforts were made by the police to prevent fights at this hotel, but without much effect; Foley afterwards built a large iron structure capable of holding 800 persons, where the police restrictions were not so strict. Later on he leased the Gaiety hall in Castlereagh-street.

Australia's greatest heavy-weight was Peter Jackson, but the first winner of the heavy-weight championship was Bill Farnan, who won it by defeating Peter Jackson at Melbourne on 26 April 1894 with a knock-out in the third round. The return contest took place in Sydney on 23 September, Farnan again proving too good for Jackson; but in the sixth round the ring was rushed by a local gang who would not have their man beaten, and the referee wisely called the match a draw. In those days rushing the ring was a frequent occurrence.

To decide championships not already determined, Larry Foley on 2 May 1885 held a competition for all comers at Charini's Circus in Belmore Park. Jack Hall and Jim Kelly fought a draw for the light-weight championship; 'Eddie' Seymour won the middle-weight title; 'Professor' Miller had no opponents in the heavy-weight division. It was then suggested that Miller should fight Peter Jackson, who defeated him easily; the heavy-weight title, however, remained in the possession of Farnan, until Tom Lees took it from him on 20 May 1886. On 25 September Jackson took it from Lees.

It is noteworthy that Foley at the White Horse hall, and Peter Jackson at the gymnasium connected with his United States hotel, produced

nearly all the best men Australia has seen in any division of boxing—Griffo, Bob Fitzsimmons, Billy McCarthy, Steve O'Donnell, and Bill Smith; the middle-weight Les Darcy, mentioned below, is possibly the only exception to this rule.

In 1890 the Sydney Amateur Athletic Club in York-street staged important championship contests; in one of these, on 2 September 1890, Griffo took from Billy Murphy the feather-weight championship of the world, and in another on 22 July 1891 retained the title. In 1892, however, Sam Matthews, who had been running a roughly conducted 'California Athletic Club' in Castlereagh-street, bought out the Amateur Athletic Club; but under his management in 1893 two deaths occurred, and boxing was stopped everywhere in Sydney.

Robert (Bob) Fitzsimmons was an unusual figure in the Australian ring. He was born in Cornwall, and went to New Zealand as a child. From a physical viewpoint he was not formidable; he was tall, stooped, very thin, knock-kneed, and apparently a sufferer from asthma. His record in Australia was by no means good, and on 10 February 1890 he was beaten by Hall for the middle-weight championship of Australia. His subsequent career in the United States is well known. Though he was about the middle-weight limit, he at one time owned simultaneously the middle, mid-heavy, and heavy-weight world's championships, a performance that will probably never be repeated.

After the set-back in Sydney, due to the ban upon fighting, many attempts to put boxing on a firmer basis were made in various suburbs. In 1902 Jim Brennan, a well-known bookmaker and racehorse-owner, became a boxing promoter, and in 1907-8 H. D. McIntosh put boxing on a footing equal to that in any other part of the world, arousing the interest of well-known figures in the professional, political, and social world. Brennan persuaded the famous negro Jack Johnson to visit Australia in order to meet the Australian champion, Bill Squires; but John Wren had already arranged that Squires should visit America, and Johnson's only fights in Australia in 1907 were against Felix in Sydney and Lang in Melbourne. Meanwhile the American pugilist Tommy Burns, who had assumed the title of world's champion, met Squires at Colma near San Francisco on 4 July 1907, and knocked him out in one round. McIntosh immediately engaged Burns to meet Squires in Australia. On his way Burns visited England, Ireland, and France, defeating the champions of each country and incidentally beating Squires again in France; in Sydney he defeated Squires for the third time. The site selected for this fight had been a Chinese market-garden at Rushcutter's Bay; it is now the Sydney Stadium. Jack Johnson, the negro heavy-weight, had been unable to meet the former world's champion, Jeffries, owing to the colour-bar, and Burns made the same objection; but McIntosh offered Burns £6000—win, lose, or draw—Johnson's portion of the prize-money being £1000 and training expenses, and a contest was arranged. It took place on 26 December 1908, Johnson winning easily.

It was in the Olympia at Newtown (subsequently burned down) that Les Darcy made his metropolitan debut in 1914. His fight with Fritz Holland, an American, drew the next largest house to the Johnson-Burns championship battle. After his defeat of the American champion, George Chip, in 1916, Darcy went to the United States (without a passport from the military officials), and died there in 1917.

The contests decided at Broken Hill in the 1890s must be mentioned. It was there that on 19 January 1891 'Ironbark' Jim Burge knocked out Billy Murphy in the 30th round, and there Burge himself, for the second time in his career, was knocked out; Burge was really a feather-weight, but met men of all poundages, and on the occasion mentioned was opposed to Billy McCarthy, a world-famed middle-weight. The little fellow was pounded by everything the big fellow had in his boxing-kit and still came up smiling, until in the 20th round McCarthy gave him the La Blanche punch, which had long since been declared foul. This blow earned its name in the following way. In a contest between Jack Dempsey, the nonpareil, and a French-Canadian named La Blanche, the latter, when on the point of being knocked out, in sheer desperation swung his right hand in back-hand fashion, and thus bringing the bone of his forearm into contact with Dempsey's jaw turned sure defeat into victory; it was ever afterwards called the 'La Blanche blow,' and many a boxer was rendered *hors de combat* by it before the authorities debarred its use. It was at Broken Hill, too, that the great natural heavy-weight Joe Goddard, who depended entirely on his capacity for taking the hardest knocks without a flinch, succeeded in beating such seasoned warriors as Charlie Dunn in 14, Owen Sullivan in 11 and 10, and Billy McCarthy in 6 rounds.

Many good bare-fist fighters have hailed from *Victoria*, the chief among them being Tom Curran and Joe Kitchen. Curran defeated Harry Sallers in Victoria on 13 March 1860 for the championship of Australia and a £600 wager; the contest lasted 2 hrs. 30 min. Joe Kitchen was never beaten as a middle-weight, and won more than £2000 in side-bets. Later, Bill Farnam was the recognized middle-weight champion and eventually won the boxing championship by his defeat of Peter Jackson. After the coming of Jem Mace, and because the authorities were determined to prevent knuckle-fighting, those who were pugilistically inclined were compelled to give vent to their feelings with upholstered hands. The first to benefit from the great English boxer's style of milling was Peter Newton; while Larry Foley was teaching Mace methods to the New South Wales men, Newton was doing likewise in Victoria. It was the Newton polish, transmitted through other teachers, that brought to light such great men as Dan Creedon, Peter Boland, Tom Tracey, the Dougherty and Duggan brothers, and many others who made history in other lands; the same was the case with the subsequent champions—Jack McGowan light-weight champion of Australia, Tim Hegarty who won feather-weight supremacy, and still later Herb McCoy who was light-weight champion and was very much of the erect stance.

One of the most important fixtures in early Melbourne took place on 9 July 1888, when Paddy Slavin and Jack Burke (who was known as 'the Irish lad' but in reality was an Englishman of the Jewish persuasion) fought a draw; the Marquess of Queensbury was the referee. In February of the following year Slavin succeeded in knocking Burke out in the third round. Mick Nathan (a retired unbeaten light-weight champion) and the Melbourne Athletic Club promoted 'the game' in a sort of way, just as was the case in Sydney; but it was the coming

of Jack Wren that put the southern capital pugilistically on the map. His first venture was in August 1905, when he staged a contest between Bill Squires from New South Wales and Dick Kernick, a heavy-weight of local fame. The battle was decided at the Exhibition building, and Squires won in 7 rounds. Wren then brought Tim Murphy and Squires together at the same place; but by this time he had gained so large a following that he was compelled to stage the next contest, which was between Squires and Peter Kling, at his own race-course at Ascot; at a later date Jack Johnson and Bill Lang met there and also Tommy Burns and Lang. Squires's sequence of wins caused Wren to regard him as a possible champion, and in order to give him a chance he offered the then champion, Jack O'Brien, £2000 to come to Melbourne and fight him for the championship of the world. The offer was a big one for those days, but it failed to induce O'Brien to leave America.

Hearing of the doings of Mike Williams of South Africa, where he was regarded as a coming champion, Wren made an offer to him; he came, and Squires knocked him out in the first round. With no more matches in sight arrangements were made for Squires's departure to America, but before he could leave, Jack Johnson, the subsequent world's champion, arrived under contract to Jim Brennan, formerly proprietor of the National Sporting Club in Sydney. Brennan was prepared to risk £1000 on his protégé, but Squires had made all his arrangements for departure. On his arrival in the States Squires failed to induce the retired champion, Jim Jeffries, to enter the ring again, and so he was matched against Tommy Burns, who had just beaten Jack O'Brien for the title. The meeting was disastrous for Squires, who was knocked out in the opening round. After Johnson had beaten Burns for the title at the Sydney stadium, Wren cabled Jeffries an offer of £10,000, win, lose, or draw, to come to Melbourne and fight Johnson for the honour, but nothing came of it.

Subsequent contests promoted by Wren took place at the old Cyclorama buildings in Melbourne, where he staged many important championship battles; one of the best fights that were ever fought took place there between Hock Keys and Frank Thorn on 2 March 1908, when Thorn won on points in a 20-round contest.

Queensland, like all other States in the early days, was the scene of many a great but unreported encounter between men who fought in the old style. Many good pugilists came from there; it was in Queensland that Paddy Slavin blossomed forth as a great fighter with nature's weapons unadorned. In this guise he beat Martin Power, the recognized champion of Queensland, and many others, before coming to Sydney to receive the Foley polish that made him one of the best of his time. Amateur boxing was indulged in freely at Brisbane, and as the result of the teaching of Jack Dowdridge and George Powell, quite a number of capable amateur boxers came into prominence, among them the Baynes brothers, who became well-known members of legal and social circles there; George Dawson, who turned professional and became perhaps the best Australian light-weight champion of all time; Arthur Scott, who became famous as the most successful teacher of amateurs; and Harry Nathan, who though once a feather-weight won the middle-weight amateur championship of Queensland. After boxing had been conducted in a happy-go-lucky kind of way, with a battle only now and then, a small company, headed by George Lawrence, who is now connected with 'the game' in America, put boxing on a more permanent basis by promoting weekly contests. During Baker's reign as managing director of Stadiums Limited he purchased from the Lawrence company their interests in the northern capital, thus forming the circuit which comprises Sydney, Melbourne, and Brisbane. Probably the most successful boxers from Queensland in recent years have been the aboriginal middle-weight Jerry Jerome and, later, Archie Bradley; both were untaught, and, as far as the coloured man was concerned, more often than not untrained. Yet their success was great. When well on in years from an athletic standpoint Jerome held his own with all who were not absolute champions. The white man, Bradley, was of the tear-in style, and by reason of his strength and staying power, to say nothing of his toughness, actually roughed and tussled his way to championship honours. He won the welter-weight title from Tommy Uren, but afterwards was twice beaten by Harry Collins. The best in recent years was Joe Russell, who was champion feather-weight of Australia for a long time. There have been many other promising boxers in Brisbane, but unfortunately they never got beyond the promising stage; chief among them was Wave Geikie, a feather-weight who, after showing championship form for a little while, deteriorated through failing sight. Another boxer who hailed from Brisbane is Paul Demsky, a light welter-weight, who is now in America where he is likely to do well against that country's second-raters.

Like all other places where gold has been found, *Western Australia* has been the scene of many a knuckle-fight, but coming as it did when that particular style of milling had been made an offence punishable by imprisonment, such contests were not recorded; besides, a majority of the miners preferred the more humane method, boxing. At Perth, Coolgardie, and Kalgoorlie many important battles were waged, and for championship honours, too. In each of these places Peter Felix (coloured), Bill Dougherty, and Mick Dooley fought and re-fought for the heavy-weight title; it remained the property of Dougherty until dethroned by Bill McColl of New South Wales at the National Club, Sydney. Dooley and Dougherty, who was a native of Victoria, gave lessons in the West, and to them was due the coming of such great boxers as Frank Thorn, who though but a 9-stone man won the feather-weight title and the light-weight and welter-weight titles as well. Fred Kay, who disputed light-, welter-, and middle-weight championships against all comers, and eventually became welter champion of Australia, was tutored by Dougherty and Dooley; so was Mick King, who won the Australian middle-weight championship and beat the American crack boxer Jeff Smith for what in Australia was regarded as the middle-weight championship of the world, Smith having previously beaten Jim Clabby, and in reality accounted for McGoorty, although an erroneous decision gave the verdict to his opponent; the authorities, however, regarded Smith as the winner, and dismissed the referee who found for McGoorty. When Darcy subsequently defeated King, the Australian authorities claimed the world's supremacy for the winner. King was the last of Dooley and Dougherty's pupils.

South Australia can boast of George Thompson, a fair-class mid-heavy-weight; the Segar brothers; Pud (an abbreviation of Pudney); and also that remarkable man Ern Waddy, who, at an age when few would dream of engaging in so strenuous a pastime, actually won the heavy-weight championship of Australia.

Though *Tasmania* has never staged continuous boxing events, there was a time when the ex-amateur welter-weight champion of Australia, Reg Midwood, ran frequent contests at Hobart. Tasmania in the olden days could boast of two light-weight champions, Mick Nathan, who beat Jack Hall for it, and Jack Reid an ex-amateur bantam and feather-weight champion who won what is known as the resident light-weight championship, when the champion, Hughie Mehegan, was away in England. W.La.

Pultenaea. See LEGUMINOSAE.

Pythons. See SNAKES.

Q

Quail, a name used generally in Australia for small game-birds belonging to the families Perdicidae (partridges) and Turnicidae (button-quails). These families, owing to numerous internal structural differences, are placed in different orders, the former belonging to the Galliformes (fowls and game-birds), the latter to the Turniciformes (button-quails and plain-wanderers). Superficially the button-quails may be distinguished from the true quails by the absence of a hind-toe; they are in consequence sometimes called hemipodes.

Of the true quail three—perhaps four—species occur in Australia. The Stubble-quail (*Coturnix pectoralis*), which is closely allied to the quail of Europe, is confined to southern Australia and Tasmania. The Brown Quail or Swamp Quail (*Synoicus australis*) is found from the Moluccas through Australia to Tasmania; in the latter island a larger race or species of brown quail (*Synoicus ypsilophorus*) also exists.

Brown Quail (*length* 6½ *in.*).

The beautiful King Quail (*Excalfactoria chinensis*) is found throughout eastern Australia, its range extending northwards through the Malay region to China.

Of the button-quails there are six Australian species, the best-known being the Painted Quail (*Turnix varia*)—the only one that extends into Tasmania—and the Little Quail (*Turnix velox*).

Quails share with ducks and pigeons the chief attentions of the Australian sportsman. Though not strictly migratory, they pass more or less regularly from the interior towards the coast and vice versa, and great numbers often appear for a time in particular districts. They are undoubtedly of great value to the farmer, as they

King Quail (*length* 4½ *in.*).

devour quantities of weed-seeds and insects, and also furnish him with a change of diet.

W.B.A.

Quailup Bells. See THYMELACEAE.

Quakers. See FRIENDS, SOCIETY OF.

Quandong, the popular name of *Fusanus acuminatus*, a species of the family Santalaceae. It is a tall shrub or small tree (20 to 30 feet)

Fusanus acuminatus.

which ranges from Queensland to Western Australia. The leaves are opposite, 2-3 inches long, lance-shaped at the apex; flowers small, in pyramidal sprays about as long as the leaves;

PAPUA
TORRES STRAIT
Thursday I.
Possession I.
Albany Passage
Albany I.
Endeavour Strait
Somerset
Cape York
CAPE YORK PENINSULA
GULF OF CARPENTARIA
Cape Melville
COOK
Laura
Cooktown
Palmer R.
Mitchell River
Mt Mulligan
Cairns
Trinity Inlet
Mulgrave R.
Bellenden Ker Mts
Innisfail
Pt Parker
Burketown
Normanton
Croydon
Forsayth
BURKE
River
Cardwell
Ingham
Townsville
Charters Towers
KENNEDY
Bowen
Port Denison
Collinsville
Nerherdale
MACKAY
Broad Sound
Mt Cuthbert
Cloncurry
Mt Isa
Selwyn
Dajarra
Hughenden
Ravenswood
Eldersliec
Winton
Aramac
Blair Athol
Emerald
Longreach
MITCHELL
NORTH
GREGORY
Cullin-la-ringo Stn
Springsure
Mt Morgan
ROCKHAMPTON
Keppel Bay
Gladstone
Port Curtis
Bustard Bay
Round Hill Head
Callide
Many Peaks
BUNDABERG
Hervey Bay
Yaraka
Tambo
Welford
LEICHHARDT
Ceratodus
Dawson
Taroom
Gayndah
Maryborough
Wide Bay
Injune
Juandah
Gympie
Adavale
Charleville
Quilpie
Mitchell
Roma
Miles
Condamine
Jandowae
Dalby
DARLING DOWNS
Toowoomba
BRISBANE
Moreton Bay
Stradbroke I.
GREGORY SOUTH
Thargomindah
Cunnamulla
Dirranbandi
Warwick
Macpherson Ra.
Wallangarra
NORTHERN TERRITORY
SOUTH AUSTRALIA
Lake Eyre
Lake Frome
Strzelecki Ck
Coopers Ck
Eyre
Diamantina
Bulloo
Paroo
Warrego
Barwon River
Darling River
NEW SOUTH WALES
SOUTH PACIFIC OCEAN
GREAT BARRIER REEF
Scale of Miles
0 50 100 150 200 250
Railways shown thus
Railways under Construction
Scale of Miles
0 5 10 15
Redcliffe
Redcliffe Pt
Petrie
Pine
MORETON BAY
SANDGATE
South
Samford
Enoggera Resr
Pinkenba
Eagle Farm
BRISBANE
Fortitude Valley
New Farm
Wynnum
Mt Coot-tha
Kangaroo Pt
Belmont
Cleveland
CABBAGE TREE RESVR
Brisbane R.
Bremer R.
Redbank
Goodna
Kuraby
IPSWICH
(Limestone Hill)
H.E.C.R
138
141
144
147
150
153
11
14
17
20
23
26
29

QUEENSLAND

fruit a bright red globular drupe, about 1½ inches in diameter, with a thin, succulent outer and a hard, bony inner coat, much pitted and wrinkled. The fleshy fruit makes an excellent sub-acid preserve or jelly, with a flavour resembling that of the black guava. A variety with a yellow fruit is called by the aborigines 'ming' or 'minche;' its outer coat is bitter. Quandongs may be preserved for use when required by extracting the nut and sun-drying the fruit. The nuts are also edible and very nutritious—so full, indeed, of oil that they will burn entirely away like candle-nuts (see ALEURITES). The timber is hard and coarse of grain, creamy-pink or flesh in colour; it takes a fine polish, and is excellent for cabinet-makers' work. The bark is used by the aborigines for tanning skins, and the nuts are often used as beads for rosaries, necklaces, bracelets, and similar ornaments.

Quarantine. See PUBLIC HEALTH.

Quartz. See MINERALOGY.

Queensland (area 670,500 square miles) is the second largest State of the Commonwealth of Australia. From 1788 to 1859 it was included in the colony of New South Wales (see COLONIES, CREATION OR SEPARATION OF).

Natural Features.—Its chief natural features are (1) the Great Barrier Reef (q.v.), which fringes its eastern coast from the neighbourhood of Port Curtis to the shores of New Guinea, and is impassable except through narrow channels considerable distances apart; (2) a coastal range of old rocks extending from New South Wales to Cape Melville, and reaching its greatest height (4000 feet) in the Bellenden Ker Range near Cairns; (3) a vast western plain stretching from the coastal range to the South Australian border, and from New South Wales to the Gulf of Carpentaria. The Great Barrier Reef is at present under investigation by a Great Barrier Reef committee, with headquarters at Brisbane, whose reports should be consulted.

North of Cape Melville the coastal range gives place to a flat, sandstone-capped ridge running through Cape York Peninsula, which gradually decreases in elevation until it reaches Cape York. From the coastal range westwards run two irregular watersheds of low elevation; the more southerly follows roughly the parallel of 25° S. lat., the more northerly that of 21° S. lat. The southern coastal range gives rise to the Logan, Albert, and Brisbane rivers (flowing into Moreton Bay), the Mary and Burnett (flowing into Hervey Bay), and the Boyne, flowing into Port Curtis. Westward of this range lie the Darling Downs, drained by the Condamine and its tributaries; and the south-western plains, watered by the Maranoa, Warrego, Paroo, and Bulloo rivers, all of which find their way to the River Darling, and thence by way of the Murray to the Southern Ocean. North of the watershed on 25° S. lat. are the Dawson, Comet, and Nogoa rivers; these meet the Mackenzie and Isaac, flowing south from the second watershed, and form the Fitzroy, which reaches the ocean at Keppel Bay. Farther west are (*a*) the Barcoo with its tributaries, (*b*) the Diamantina and Georgina, flowing from the Barkly Tableland, which is the western termination of the second watershed. The Burdekin, the chief river of Northern Queensland, flows southward behind the north-east coast range until it is joined by the Belyando and Suttor from the south; it enters the ocean near Cape Upstart, by a mouth choked with sandbanks. On its eastern side the north-east coast range gives rise to the Herbert, Johnstone, and Mulgrave rivers, and on its western slope to the Gilbert, Lynd, Palmer, and Mitchell, all flowing into the Gulf of Carpentaria. West of the Gilbert are the Norman, Flinders, Leichhardt, and Albert rivers, also flowing into the Gulf of Carpentaria.

Rainfall.—The coastal range being sufficiently high to intercept rain-laden clouds from the Pacific, the precipitation of rain on the eastern coast is very great, amounting to 135 inches per annum at Innisfail but decreasing to 40 inches per annum south of Port Curtis. On the Downs and other plateaux between the coastal range and the western plains the fall ranges from 40 to 30 inches a year, gradually decreasing to 9 inches on the western border.

The natural waters of western Queensland are in time of drought wholly insufficient to support the flocks and herds. For many years before 1883 it was supposed that large quantities of artesian and sub-artesian water lay beneath the surface; in that year a hydraulic engineer's department was organized by J. B. Henderson, deep boring was begun, and in a few years artesian bores had been sunk all over western Queensland and more than half the State had been proved to be within the Great Artesian Basin (see ARTESIAN WATER).

Land and Minerals.—The land between the coast range and the Pacific is for the most part extremely fertile, and was originally covered with jungle or rain-forest (locally called 'scrub'); large tracts, however, are mere sandy waste. Sugar-cane is cultivated in the wet belt along the coast. West of the coast range the land is open forest country, or downs well adapted for wool-growing; where the rainfall is sufficient, cattle are depastured in immense numbers. The coast range is rich in minerals, and includes the State's chief gold, copper, and coal fields. The older rocks, where they come up again in the Cloncurry district, are rich in metals. Copper and silver-lead have been mined with success on these fields, but their distance from the seaboard is against successful working.

History.—(For the discovery and exploration of Queensland see AUSTRALIA, DISCOVERY OF, EXPLORATION BY LAND, and EXPLORATION BY SEA) The first point on the coast seen by Europeans was the eastern coast of Stradbroke Island, sighted by Cook on 17 May 1770. The first landing of the British took place on 24 May, when Cook landed under the lee of Round Hill Head, the southern point of Bustard Bay; an obelisk with a commemorative tablet has been erected on the spot. On Possession Island in Endeavour Strait, where he formally took possession of the eastern coast, an obelisk has been placed by the federal authorities. The first settlement (see BRISBANE) was made at Moreton Bay in 1824. The commandants between September 1824 and May 1842 (when the penal settlement was finally broken up) were:—

1824. Lieutenant Henry Miller, 40th Foot.
1824–5. Captain Bishop, 40th Foot.
1825–30. Captain Patrick Logan (q.v.), 57th Foot.
1830–5. Captain J. O. Clunie, 17th Foot.
1835–7. Captain Foster Fyans (q.v.), 4th Foot.
1837–9. Major Cotton, 28th Foot, afterwards Lieutenant-general Sir Sydney Cotton, G.C.B.
1839. Lieutenant George Gravatt, 28th Foot.
1839–42. Lieutenant Gorman, 80th Foot.

Oxley's examination of the Brisbane River

was continued by Major Edmund Lockyer (q.v.) in September and October 1825. The country to the southward was explored by Captain Logan in 1826 and 1827 (when the Logan River was discovered) and again in 1828, when he was accompanied by Allan Cunningham, who also in that year examined the upper portion of the Brisbane River. The discovery of limestone on the banks of the Bremer River led to the establishment of a small out-station at Limestone Hill in 1826, and out-stations were afterwards formed at New Farm, Eagle Farm, and Redbank, on the Brisbane. The tracks connecting these places with the settlement were the first roads in the State.

The suitability of Moreton Bay for free settlement was revealed to Lord Bathurst by Oxley's report, which called attention to its resources of valuable timber; the chief of these, the Brisbane or Hoop Pine (*Araucaria Cunninghami*), was discovered by Oxley and described by Cunningham. It was not, however, until May 1839 that it was decided to break up the penal settlement, and three surveyors (Dixon, Chetwynd-Stapylton, and Warner) were sent from the Richmond River in New South Wales to make the surveys necessary before throwing open the land for free settlement. Strict regulations were made to prevent the intrusion of unauthorized persons, and thus the troubles which occurred at Port Phillip were prevented. In November 1842 Captain J. C. Wickham, R.N. (formerly of H.M.S. *Beagle*) was appointed police magistrate at Moreton Bay and arrived in Brisbane with John Gregor, the first incumbent of St. John's, Brisbane—a parish which at that time included Moreton Bay and the Darling Downs. Limestone Hill, under the name of Ipswich, became a second centre, and at one time was the rival of 'the Settlement,' as Brisbane continued to be called for several years.

Pastoral occupation of the Darling Downs began in 1840, and by 1842 the valleys of the Logan and Albert rivers and the head-waters of the Brisbane were occupied, in spite of much hostility from the aborigines. In May 1842 the pastoral districts of Darling Downs and Moreton Bay were proclaimed, and Stephen Simpson was appointed commissioner of crown lands at Moreton Bay. The Mary River was occupied in 1843, but the aborigines murdered the shepherds and prevented permanent settlement for some years. The great drought of 1841-3 affected the settlers seriously, and closed the stock-routes. Boiling-down works were established at Kangaroo Point by John Campbell in June 1843, but no relief came until the breaking of the drought. The cessation of transportation in 1840 had brought about a dearth of labour, but the flocks and herds of the squatters increased and pastoral occupation stretched out north and west, Henry Stuart Russell and others crossing from Darling Downs to the head of the Burnett. In 1846 and 1847 J. C. Burnett, a surveyor under instruction to find an overland route to the North Australia settlement at Port Curtis (see GLADSTONE COLONY), discovered the river which bears his name, and traced it to the sea at Hervey Bay; within two years the Wide Bay and Burnett districts were occupied, and the town of Gayndah was founded. About the same time Warwick and Drayton on the Darling Downs were surveyed, and Maryborough on the Mary River was settled in 1848. The first emigrant ship direct to Moreton Bay, the *Artemisia*, arrived in 1848, and was followed by the *Chasely*, *Lima*, and *Fortitude*, in which many persons had been persuaded to embark by unofficial promises of land orders. These were not redeemed, but the immigrants soon found opportunities of advancement in the towns which were springing up under the stimulus of good seasons. In 1850 crown lands commissioners were appointed for the districts of Wide Bay and Burnett. The upper Dawson was occupied in 1851 and 1852; in May 1853 the Fitzroy River was discovered by the Archers, who settled at Gracemere near Rockhampton. In January 1854 two new pastoral districts, Port Curtis (extending from the Burnett to Broad Sound) and Leichhardt (comprising the hinterland of Port Curtis), were proclaimed, and the towns of Gladstone and Rockhampton were surveyed and sold. Gladstone, the most northerly port, received much assistance from the government at Sydney, to the detriment of the original settlement at Moreton Bay. The Canoona gold-rush of 1858 attracted population to the valley of the Fitzroy, though there was nothing in the field to justify hope.

Leichhardt's journey to Port Essington in 1844-6 had made known the existence of the Dawson, Comet, Mackenzie, Isaac, Suttor, and Burdekin rivers, flowing through country well fitted for pastoral occupation. The explorations of Sir Thomas Mitchell farther west in 1846-7 proved that the Maranoa and Warrego districts were fertile and well-watered tracts. Passing over the southern watershed, he also discovered splendid country on the Salvator, the Belyando, and the Barcoo. The Maranoa was occupied in 1848, and was proclaimed a pastoral district in 1850; but settlement was slow until about 1858, after which progress was rapid and towns sprang up. Roma and Charleville are the chief south-western towns. In 1856-9 William Landsborough, P. F. MacDonald, W. Kelman, W. H. Gaden, and other squatters in the Port Curtis district explored the country round Rockhampton, stations were formed, and wool was brought to the heads of navigation by bullock-drays over tracks dangerous in themselves and infested with aborigines. A force of black police, organized in 1848 by Frederick Walker, afforded much protection, but murders of squatters, teamsters and shepherds were common. In October 1857 a station on the Dawson named Hornetbank was attacked, and 11 persons were murdered.

The progress made by these settlers led to a movement for separation, which involved a clash of interests and a dispute as to the boundary of the proposed new colony. On 6 June 1859 letters patent passed the great seal under which (and by virtue of the act 18 and 19 Vict. c. 54) the north-eastern part of the colony of New South Wales was erected into a separate colony, to be called the colony of Queensland. Sir George Ferguson Bowen, the appointed governor, arrived in Brisbane on 10 December 1859, and the colony of Queensland came into existence. The first parliament met on 22 May 1860—a date wrongly supposed by Bowen to be the anniversary of the discovery of Moreton Bay by Captain Cook (as a matter of fact, he was in Hervey Bay on that day in 1770). During the first ten years of its history the new colony's only source of wealth was found in pastoral pursuits. Attempts were made to encourage agriculture, and to prevent the occupation of crown lands without stocking them, but the revenue was not greatly increased. The northward and westward advance of the squatters (many of them from New South Wales and Victoria) was continued in spite of many obstacles, in-

cluding the hostility of the aborigines; in October 1861 Cullin-la-Ringo (near Springsure) was the scene of the massacre of H. Wills and his family and servants, 17 persons in all. New pastoral districts were proclaimed—Mitchell, Gregory, Kennedy, Burke, and Cook.

The American civil war (1861-5) gave a great impetus to the growing of cotton and sugar. An electric telegraph-line was laid from Brisbane to Sydney in 1861, and in 1863 the first sod of the first railway was turned. In 1865 the railway was opened between Ipswich and Grandchester, on the way to Toowoomba. In 1866 the failure of Overend, Gurney and Co., and of the Agra and Masterman's Bank in London, caused a serious financial crisis in Queensland, the government being forced to stop payments, and for the next few years the colony suffered from the effects of this as well as from the low price of pastoral produce.

In 1859 began an extension of settlement to the north of Rockhampton, and in 1861 the town of Bowen was founded on Port Denison. The disastrous journey of Burke and Wills, and the relief expeditions of John McKinlay, A. W. Howitt, Frederick Walker, and William Landsborough, opened up the western country between the Gulf of Carpentaria and the South Australian border; pastoral settlement on the Warrego, Barcoo, and Flinders rivers followed, and in 1863 stations were formed as far west as the border, which had been fixed in 1862 on the 138th meridian. On the coast the town of Cardwell, founded in 1862, became a centre for northern development, being the terminal point of the electric telegraph to the Gulf. In 1864 the long-projected harbour of refuge and coaling station in Torres Straits was formed at Somerset in Albany Passage, and John Jardine was placed in charge. Burketown on the Albert River was visited by a vessel called the *Jacmel Packet*, chartered by R. Towns and Co. in 1865. Thus within six years of separation settlement had begun in the northernmost and westernmost parts of Queensland. About the same time Cleveland Bay was found to give better access than Bowen to the stations on the upper Burdekin, and Robert Towns (q.v.) sent his vessels to the spot on which Townsville has since been built.

The depression which affected the colony passed away when in 1868 gold was discovered at the head of the Mary River, and the Gympie goldfield came into existence. The recovery of wool-prices after the Franco-Prussian war re-established the pastoralists, and the discoveries of new goldfields at the Cape River, Ravenswood, Charters Towers, and the Palmer brought much prosperity. About 1867 the timber-covered flats near the mouth of the Burnett River in Hervey Bay were visited by timber-getters, and soon the timber was replaced by sugar-cane. The soil of the Woongarra scrub, in the midst of which is the 'Sloping Hummock' seen by Flinders, proved to be immensely valuable; very soon the town of Bundaberg was surveyed, and in 1870 began its history of continuous prosperity. The discoveries of George Elphinstone Dalrymple and William Hann on the north-eastern coast in 1872 and 1873 also proved valuable. The wealth of the alluvial lands along the coast, as well as the discovery of gold in the river-beds, brought large numbers of people to Queensland. In 1873 Cooktown sprang up in a day on the spot where Cook had beached the *Endeavour* 103 years before, and in 1876 the town of Cairns was founded on Trinity Inlet.

The early eighties were marked by efforts to build a railway on the land-grant system from Roma to Point Parker on the Gulf of Carpentaria; public feeling was divided on this scheme, it was never debated on its merits, and came to nothing. As a counterblast, a ten-million loan was floated in 1884 to carry out a vigorous policy of public works. The next few years saw much activity throughout the colony, but 1893, the year of failures in all the colonies, did not spare Queensland; the Queensland National Bank, in which government accounts were kept, was forced to close its doors. Then came a period of extreme depression aggravated by the ravages of the cattle-tick (q.v.). The country had barely recovered lost ground when in 1901 the rainfall failed, and a drought marked the opening years of the century. Political turmoil followed, and a Labour party (q.v.) appeared in parliament. In 1915 this party assumed office, and among other changes brought about the abolition of the legislative council in 1921. Since then there has been but one house of parliament.

Communications.—Communication by sea was originally carried on by cutters and schooners, small enough to enter the barred mouths of the rivers and proceed to the head of navigation; there land communication began, and was carried on by bullock-drays. Steamers gradually displaced the sailing-vessels, and railways began to take the place of the drays. The line from Ipswich to Grandchester was extended to Dalby by 1868; it now runs out to the Warrego, a south-eastern extension runs to Dirranbandi near the border of New South Wales, and a southern extension connects with the New South Wales railways at Wallangarra. In 1868 a line was begun from Rockhampton to Westwood, which has since been pushed on to the Thomson River and down the Barcoo; short lines run out from Mackay and Bowen; Townsville is the sea terminus of a northern system now extended to the Flinders; and Cairns and Cooktown are the terminal points of lines running into the coast range. All these lines, from Brisbane to Cairns, are connected by a line running roughly parallel with the eastern coast. The Cooktown line is still isolated, as is a line from Croydon to Normanton in the Gulf country. Travel in Queensland has been revolutionized by the motor-car, which is in general use on the western plains; aeroplanes, too, are often used not only for emergencies but for the inspection of cattle and sheep at distant stations. A main roads board is occupied with the conversion of ancient tracks into good roads.

The fact that Queensland lies for the most part within the tropics necessarily gives it a hot climate, but the discomfort is considerably modified on the eastern coast by the operation of the trade-winds. The elevated parts of the coast range are always cool, and the Atherton plateau behind Cairns has a temperate climate. The western plains are very hot in summer, and extremely cold in winter. Droughts are frequent, but the territory is so large that they are practically never general; railways facilitate the rapid transfer of stock from drought-affected districts, and loss is reduced to a minimum.

See Coote's *History of the Colony of Queensland* (Brisbane, 1882); Russell's *Genesis of Queensland* (Sydney, 1888); Bartley's *Opals and Agates* (Brisbane, 1892); Knight's *In the Early Days* (Brisbane, 1895); Palmer's *Early Days in North*

Queensland (Sydney, 1903); Petrie's *Reminiscences of Early Queensland* (Brisbane, 1904); Bernays's *Queensland Politics During Sixty Years* (Brisbane, 1919); Jack's *Northmost Australia* (Melbourne, 1922); Craig's *Moreton Bay Settlement* (Brisbane, 1925); Pugh's *Almanac* (Brisbane, 1859-1925); the *Queensland Geographical Journal* (Brisbane, 1885-1925); and the *Journal* of the Historical Society of Queensland, 1913-25.

F.W.S.C.-S.

Queensland Bean. See ENTADA.

Queensland Ebony. See BAUHINIA.

Queensland Grass-cloth Plant. See PIPTURUS.

Queensland Hemp. See SIDA.

Queensland Kauri. See PINES.

Queensland Nut. See MACADAMIA.

Quick, SIR JOHN, born near St. Ives in Cornwall, England, on 14 April 1852 was brought by his parents to Australia in 1854, and in 1873 joined the staff of the Melbourne *Age* and in his spare time studied at the university of Melbourne (B.A. and LL.B., 1877; LL.D., 1882). He was called to the Victorian bar in 1878, and in 1880-89 represented Sandhurst (the name by which Bendigo was then known) in the house of assembly. After his defeat in 1889 he devoted himself to the advocacy of federation, was a member of the Corowa conference in 1893 and of the Bathurst convention in 1896, and at Corowa originated the scheme afterwards adopted by George Reid of choosing the next federal convention by popular election. To that convention (1897-8) he was elected by Victoria. In 1901 he was returned to the house of representatives in the Commonwealth parliament as representative for Bendigo, and held the seat till 1913. In 1904-7 he was chairman of a royal commission on the tariff, and in 1909-10 postmaster-general in the third Deakin ministry. In 1922 he was made deputy president of the federal arbitration court. He has published several books on constitutional questions, the most important of which are *The Annotated Constitution of the Australian Commonwealth* in collaboration with R. R. Garran, and *The Judicial Power of the Commonwealth* in collaboration with L. E. Groom. (Kt. Bach., 1901.)

Quinine Tree. See PETALOSTIGMA.

Quinn, JAMES (1819-1881), born at Rathbawn in Ireland on 17 March 1819, educated in the Irish College at Rome, and ordained priest on 15 August 1847, after 12 years of parochial and scholastic employment in Dublin was on 14 April 1859 appointed first Catholic bishop of Brisbane. He at once set about collecting priests and other helpers, but did not reach Brisbane until 10 May 1861; his energy and administrative powers speedily organized the diocese and extended its instrumentalities into the remoter districts of Queensland. In 1874 he consecrated and opened for worship the cathedral of St. Stephen. Outside the sphere of religion his chief achievement was the foundation of a Queensland Immigration Society, intended to intercept for Australia some of the thousands of Irishmen who were in the early sixties migrating to the United States. With the assistance of the government he secured agents in Ireland, and about 6000 immigrants were brought out; but in 1864 the Queensland authorities passed acts which made immigration a state affair, and the bishop's society was dissolved the next year. In 1875 he altered his name to O'Quinn. He died on 18 August 1881. A brother, Matthew Quinn, was bishop of Bathurst from 14 November 1865 till his death on 16 January 1885. See ROMAN CATHOLIC CHURCH.

Quintinia, a small genus of the family Saxifragaceae, consisting of shrubs or trees, found in Australia and New Zealand. The flowers are small and white; calyx-teeth 5; petals 5, falling early; fruit a capsule; leaves alternate. *Q. Sieberi* (Opossum Wood), a tree occasionally reaching 50 feet, bears masses of pure white flowers that remind one of those of

Q. Verdoni.

the privet; it often germinates on the trunk of a tree-fern, grows till its roots touch the ground, and in the end destroys its host. It has a corky bark and a hard, short-grained timber, sometimes locally used for flooring-boards. *Q. Verdoni* is a small tree with pale-yellow flowers in elongated spikes, which usually grows in coastal brush forests.

Quiros, PEDRO FERNANDEZ DE. See AUSTRALIA, DISCOVERY OF.

R

Rabbit, The. No occurrence in the history of Australia has so profoundly affected her economic development as the introduction of the rabbit; the cost to New South Wales alone since it first began to be regarded as a pest is beyond calculation. Besides the millions of pounds that have been expended in fencing, netting, poisoning, fumigating, and digging out, the loss to the Commonwealth from the deterioration of pastures, and from the consequent lessened output of wool, live stock, and food crops, runs into some hundreds of millions. With the removal of the rabbit the capacity of the Commonwealth for carrying live stock would probably be increased by 25 per cent. But the cost is not to be measured only by decreased power of production and the expense of extermination; there has also to be considered the general effect upon economic and industrial life. For a number of years many men have been turned aside from developmental work to follow the rabbit; a nomadic class has been formed of men, women, and children who move from district to district, trapping it.

Notwithstanding the immense destruction of the pest which has been going on for years, there are at the present moment in most infested parts as many rabbits as there ever were. In those Riverina districts of New South Wales which were invaded by them 45 years ago, they are more numerous than ever. The basic causes of its persistence in the face of the onslaught which has been made upon it, are (1) the rabbit's extraordinary adaptability, (2) the slipshod manner in which accepted methods of control and eradication have been applied.

Historical.—The European rabbit—like one species of the prickly pear—was a 'First Fleeter.' A census of live stock taken at Port Jackson on 1 May 1788 includes five rabbits, three of which belonged to the governor. In 1791 some (number not recorded) were introduced from Cape Town by Governor King. According to Surgeon Cunningham they were being bred in hutches in New South Wales in 1825, but there were none wild. In Tasmania they were enumerated among the domestic animals in 1824, and *Bent's Almanac* for 1829 says that in 1827 'many thousands of rabbits increased on Betsey Island.' The Hobart *Colonial Times* of 11 May 1827 mentions the fact that the 'common rabbit' was running about on some large estates in thousands. This is the first record of their existence in numbers in a wild condition in any Australian State. To Victoria the rabbit came with the pioneers. Before the first government official had made his appearance in the village on the Yarra, a committee of the 'trespassers' (see VICTORIA) on 2 May 1836 decided a dispute which had arisen between John Pascoe Fawkner and Henry Batman concerning—among other matters—the destruction of certain rabbits belonging to Fawkner.

In 1842 Commander J. L. Stokes of H.M.S. *Beagle* landed on an islet in Bass Strait, near Corner Inlet, and named it Rabbit Island 'from the abundance of rabbits' thereon. He turned some loose on Deal Island, in Bass Strait, 'for the benefit of any unfortunate voyagers who might be thrown hungry ashore in this locality.' In 1844 Rabbit Island was described as abounding in rabbits, which afforded 'good sport and fresh meat to the whalers.' The *Port Phillip Patriot* of 26 June 1846 stated that numerous rabbits had taken refuge under the police office, where they had increased rapidly. There were many subsequent importations into New South Wales and Victoria, but the menace really dates from 1859, when the Black Ball clipper *Lightning* arrived in Hobson's Bay with 24 wild rabbits for Thomas Austin of Barwon Park near Geelong, to whom they were delivered four days later. They were soon well established there—so much so that three years later they were reported to be 'a pest.' About the same time they were flourishing on Thomas Holt's estate, The Warren, Cook's River, near Sydney, but it is improbable that they spread inland from that locality. As showing the marvellous power of the rabbit to accommodate itself to new conditions it is interesting to note that within six years after Austin turned out 13 of them at Barwon Park he had killed off 20,000, and there still remained, according to his computation, at least 10,000 more. Not long after their introduction into Victoria a man was charged at the Colac police court with having shot a rabbit, the property of John Robertson of Glen Alvie, and was fined £10. A few years later Robertson's attempt to stamp them out cost him £5000.

From Barwon Park they spread over Victoria, northwards, north-east, and west. Towards the end of the seventies they crossed the Murray River into the Riverina district and established themselves there. They crossed the Murray into South Australia about 1878. In New South Wales they were first mentioned in official reports in 1879, when it was stated that they were spreading fast on the Lower Murray and had obtained a footing on the Murrumbidgee as far up as Yanco Creek. From that time landholders have waged unending war against them; the pest has threatened their very existence. Within a few years of their crossing the Murray they infested thousands of square miles in New South Wales, but although they had traversed that State from south to north, and had reached Queensland, there were large areas which had not been invaded. These included the whole of the coastal division of the State, and also—in the central and western divisions—those parts which were more or less

heavily wooded—as, for example, the great Pilliga scrub. Yet as early as 1847 there were exceptions to the rule, and colonies of them were to be found at Bathurst and elsewhere. In 1883 and 1884 attention was called in the Queensland parliament to their rapid approach from the south; in 1884 they were said to be 200 miles off, in 1885 only 130 miles. They appear to have crossed the border between South and Western Australia in 1895. The report came from settlers at Eucla, about three miles from the border; only an odd one or two had been observed, but three years later they had reached Esperance.

A geological factor contributed to their spread over western Victoria and New South Wales. There is a wide and practically continuous strip of 'alluvial' running up through the country—chiefly red loamy or sandy soil, in which the rabbit finds an ideal stronghold. Safely ensconced there, it spread in every direction and probably two-thirds of the continent have been penetrated by it. It lives and thrives under any climatic conditions, whether in an area of 7-inch rainfall or in that of the Tweed River, where it seldom registers less than 75 inches. It will subsist on a diet of seeds which have been shed in a previous season and on the sparse foliage—even the dry roots—of indigenous xerophytic plants, or regale itself on the herbage and grass of the well-watered coastal districts.

Legislation and Administration.—The rabbit was referred to as a 'noxious animal' in the *New South Wales* Pastures and Stock Protection Act of 1880, and from then onwards a succession of enactments have been passed to curb it. The first of importance was the Rabbit Nuisance Act of 1883, which authorized the appointment of inspectors with power to enter upon all lands in order to enforce rabbit destruction; destruction on crown lands also was to be carried out under their supervision. During this period hundreds of thousands of pounds were paid for rabbit scalps—an expenditure which turned out to be both wasteful and useless. In the seven years from 1883 to 1890 the total expenditure of the New South Wales government was no less than £1,543,000; for scalps alone £917,000 was paid out between 1883 and 1887. The Pastures Protection Districts were constituted under the Pastures Protection Act of 1902; the present administration is through boards working under an act of 1912 and the amendments of 1918 and 1920. There are 64 of these boards throughout the country, each composed of eight directors and employing field-staffs of stock inspectors and rabbit inspectors.

In *Victoria* the rabbit is dealt with under the Vermin and Noxious Weeds Act of 1922, which is administered by the department of crown lands under the direction of the minister. The staff consists of a superintendent, two chief inspectors (each taking half of the State), 103 district inspectors, and a central administrative staff. In *Queensland* there are local boards in the infested districts, of which there are nine. These boards, originally created in 1892, but now working under the rabbit act of 1913, are empowered to levy assessments on the stock-owners for the purpose of destroying rabbits and for erecting rabbit-proof fences. Netting for such fences is supplied by the government as an endowment. In one district the administration has been taken over by the government, through the lands department. The government also encourages private owners to erect rabbit-proof fences by supplying the necessary netting on long terms of repayment. The destruction of rabbits is compulsory on holdings which are enclosed with rabbit-proof fences, but the owners of the properties can be exempted from the payment of assessment by reason of such enclosure. In *South Australia* the government administers the acts relating to vermin (including rabbits) destruction through district councils and vermin boards, which are required to enforce their provisions strictly in every respect. Despite the fact that rabbits should be destroyed at all times the commissioner of crown lands fixes and advertises periods (winter and summer) for their simultaneous destruction. These periods are fixed to suit different localities, and the controlling bodies are advised of such periods in order that concerted action may be taken. In *Western Australia* the act is administered by the minister for agriculture and officers appointed by him. The various road boards throughout the State act as vermin boards also. They can strike a rate and appoint an inspector to enforce the powers conferred on them by the act. In *Tasmania* the work of administration is carried out by local authorities, who appoint inspectors to control insect pests, collect dog licences, keep strays off the roads, and act as health and rabbit inspectors. The State appoints a chief inspector for all this field, and one special rabbit inspector, who receives all municipal inspectors' monthly reports, conducts the correspondence with 42 municipal councils, and gives demonstrations of rabbit destruction.

Rabbits and Live Stock.—While the recognition of the rabbit as a menace is universal, the various ways in which it affects the land and its products are not so well known. It is a robber more insidious than picturesque; where it does not lay bare the pastures altogether, it eats their heart out, allowing only the poorer grasses and herbs to seed. Many of the barren 'gibber plains,' 'quartz downs,' and 'jumping sandhills' of the interior are due to it. It ringbarks and kills the larger timber; it also eats millions of seedlings, including those of trees so useful for fodder, e.g. the mulga; then, when the ground has been bared, the wind gets in and sweeps away the red sandy surface soil, and nothing will grow. Moreover, by selective feeding the rabbit gradually alters the whole of the natural pasture of a district; only by slow stages will that pasture ever 'come back.'

Fencing and Netting.—Whatever measures may ultimately be taken to eradicate the rabbit, it seems certain that over the greater part of the Commonwealth nothing really effective will be achieved without rabbit-proof fences. In some parts of the comparatively dry interior, and in some mountainous parts, netting cannot be effectively and economically maintained; but over the greater part of the more productive lands it can and must be erected and maintained if the rabbit is to be controlled. Only a small percentage of the existing fences are kept in a rabbit-proof condition.

Barrier Fences.—With the advent of the scourge a demand was made in New South Wales for the construction of long stretches of barrier fencing. It was hoped that these would segregate the rabbits, and so make it easier to deal with them. Great fences were consequently constructed at a huge cost to the State, but they failed to achieve the desired result. Other States had a similar experience, notably Western Australia, where no fewer than 2023 miles of

fencing were erected at a cost of £413,531; but the rabbits were already within.

Methods of destruction.—Recourse is had to various methods, the principal being:—(*a*) the destruction of harbourage, and of the burrows themselves. This is regarded—speaking generally—as absolutely necessary. Deprive the rabbit of a stronghold, and the rest is simple. Though unfortunately there are many areas in which the physical conditions make destruction of harbourage impracticable, on the whole it is within the range of economic possibility. It can, however, hardly be considered an all-sufficing method, and should be only concomitant to practically all other forms of eradicatory work. (*b*) Trapping. This is one of the simplest methods and has had a great vogue in recent times because of the rise in value of rabbit-skins. Other methods may be more efficacious as well as cheaper, but they do not give the hunter the skin which he is after. The old-fashioned 'gin' or spring-trap is the one principally used, but many properties have been cleared chiefly by the use of wire-netting traps inserted in the mouths of the burrows. The professional trapper, working for a living, does not exterminate the rabbit; it would not pay him to do so. He may be likened to a man working a crop of lucerne, who cuts it down so that the healthy plants which are left will make it worth his while to return and reap another crop. Still, the trapper is a useful adjunct, although the landholder who wishes to clear his run must carry on simultaneous or follow-up work. (*c*) Poisoning. Great use has been made of poisoned water and poisoned baits of various kinds. Poisoned water is essentially a method for the dry districts, and a vast aggregate destruction has been wrought by it. The best-known poisoned bait is phosphorized pollard; but strychnine baits have come more and more into use because by their rapid effect they enable the rabbit-hunter to secure the coveted skin. Decoys are sometimes employed with one poison or another. (*d*) Fumigation of the burrows with various compounds. This is one of the oldest methods. Of the older fumigants carbon bisulphide has been until recently the most widely used, but though it is effective as a lethal agent, more modern fumigants are likely to supersede it. Sulphur dioxide is still employed economically and with effect; but calcium cyanide is coming to be regarded as far-and-away the best agent of destruction in mixed country, as it probably is even in the wide areas of the far west. Of late considerable use has been made of carbon monoxide gas also.

Rôle of the dog in rabbit destruction.—Although large numbers of rabbits are destroyed by dogs, their use must be regarded as merely an adjunct to other methods. In locating the haunts of rabbits, in driving them into burrows as a preparatory step to fumigation, in general rabbit 'drives,' and the like, the dog is invaluable; but the most important service he can render is in finally clearing up a holding and keeping it clean. After the clearing up, useful work may be done by shooting, in company with a dog or two. On badly infested lands large hauls are made by means of 'drives,' a method which is often employed in concerted operations for the clearing of an area.

Use of ferrets.—The ferret has been a regular aid in rabbit eradication from early times, but is of no importance in rabbit destruction on a large scale.

The Rodier method.—Rodier's method of destroying rabbits by elimination of the does and encouragement of the bucks, has been more widely discussed than any other. The notion is in all probability one which would have been long ago laid to rest had suitable tests been made; but even if Rodier's arguments were biologically sound, the application of his method on any great scale would be wholly impracticable. He holds that his system is equally applicable to rats, sparrows, starlings, etc., and he would have the health and civic authorities throughout the world set free all the male rats that are caught in the course of clearing up a city.

Coleman Phillips's plan.—The name of Coleman Phillips—a New Zealander—has been rendered nearly as familiar as that of Rodier by his pertinacious advocacy, for more than 40 years, of a method of destroying rabbits by means of natural enemies and certain diseases. His scheme, like that of Rodier, besides obtaining much publicity in the press, has been much talked of by pastures protection boards and others associated with rabbit administration; but there is no evidence to support Phillips's claim that wonderful results have been achieved by it in New Zealand.

Cost of Rabbit Eradication.—In a land in which the climatic and physiographical conditions vary so greatly, and in which accessibility and the cost of transport are such important factors, it is difficult to get out any table of the comparative cost of the various methods of rabbit destruction. It is evident, however, that in the long run the cheapest is that of fencing-in an area and then completely removing harbourage, fumigating by modern methods, and destroying the burrows.

Drought and the Rabbit.—In the drier districts of all the States of Australia drought is the greatest enemy of the rabbit, and has destroyed countless numbers. At such times they eat up every vestige of grass and herbage, destroy many young trees, and ringbark others. It is unfortunate that drought has had a sedative effect upon people in the areas affected; when they see the rabbits prospering (and destroying the pastures) they comfort themselves with the assurance that a drought will ultimately come and kill them off. As a consequence, their land is already so badly affected by the rabbits' presence that even a short dry season assumes the aspect of a long drought.

Diseases.—The rabbit is affected by several diseases, and notably by one caused by the 'Yalgogrin microbe;' large numbers are killed off by it. A septicaemia is produced, due to organisms of a pasteurella group. Coccidiosis, a parasitic disease produced by a sporozoan parasite, is also of common occurrence, and causes many deaths. The bladder worm, producing rabbit hydatids, is also widely distributed and occasionally very destructive. In 1906, at the instance of a committee of pastoralists of New South Wales (known later as the 'Rabbit Destruction Fund Committee'), Dr. Jean Danysz, of the Institut Pasteur, was invited to experiment with a virus containing a micro-organism recommended by him. Experiments were carried out on Broughton Island, a little to the north of Port Stephens, others were made in laboratories in Sydney, and the organism was found to be very deadly under certain circumscribed conditions. The conclusion was reached that the organism was similar to one isolated during the occurrence of an epidemic among rabbits at Yalgogrin and Gundagai in New South Wales.

The 'Yalgogrin microbe,' as it came to be called, produced precisely the same effects as the Danysz organism, and there appears to be no doubt that the two are identical. Chicken-cholera in rabbits, which aroused so much attention when, in 1887, the New South Wales government offered a reward of £25,000 for a method of extermination, became the subject of investigation by the royal commission of 1888 and by C. J. Pound of Queensland. When the commission was making its enquiries it was not realized that the disease was already in Australia; that discovery was made by Pound shortly after the commission had done its work. Apart from the danger of its dissemination, it was found that the disease, though highly destructive, was far more costly to handle than some other methods.

Natural Enemies.—These are divided into two groups, indigenous and introduced. The most notable native enemies are the dingo (q.v.) and certain dasyures or native cats (q.v.) among the mammals, and the wedge-tailed eagle or 'eagle-hawk' (see HAWKS) among the birds. Among the introduced, the chief is the domestic dog; next to it come the fox and the domestic cat gone wild. While dogs play a great part in destroying rabbits, they have also caused an immense destruction of sheep. There have been many proposals to introduce the mungoose, stoat, and weasel; but very little help could be expected from these, and the danger to wild life would be very great. Carnivorous ants have also been suggested—an extremely hazardous experiment.

Natural History.—The rabbit of Australia is a rodent of the species known as *Lepus* (*Oryctolagus*) *cuniculus*, and is the common wild rabbit of Europe. In its form and general habits there has been no material departure from the original. The number of young is, on the average, about five, but may vary from one to as many as eleven; the rate of increase is dependent upon the season and the abundance or scarcity of food. The period of gestation is about 28 days. The young are always born blind and without hair; they commence to leave the burrow and to feed outside within from 12 to 14 days. At the age of three weeks they are lively, can run, and are well able to look after themselves. The female begins to breed at about four months, and under favourable circumstances may have six litters in one year. Where the infestation is great, many varieties of colour are to be seen, white, black, and rufous being the most noticeable. Different types of country produce different types of rabbit. On open lowland country they are generally of a light build and have short fur; in rough upland country they are more robust and their fur is longer. These variations are quite distinct from those caused by good and bad seasons. During and after migration—as in passing from a very dry area to one which is wet, or from soft ground to hard—slight variations of type in a creature so quick-breeding and variable are rapidly brought about. Only a prolific and rapidly maturing animal, in which better or more suitable types can be thus quickly evolved by natural selection, could have overcome all the dangers of migration in the many varieties of soil and climate that Australia presents. By nature extremely shy, nevertheless, if not molested, it soon becomes accustomed to the presence of man, and will sometimes remain above ground (though alertly watchful) even when closely approached. It is essentially a night or twilight feeder; at other times of the day, especially when dogs are present, there may be thousands of them about, but none visible. Although not naturally adapted for swimming, the rabbit will, when compelled, take to water and cross rivers or creeks.

Incidental to the use of poison for rabbits there has been a very great destruction of wild life and live stock. Phosphorus poisoning has been one of the principal causes of death among native birds; in far western parts poisoned water has destroyed large numbers. Horses, cattle, sheep, and pigs have been killed in considerable numbers also; as many as 800 sheep have been poisoned in one lot. Phosphorized baits, however, are not used so extensively nowadays as they were in bygone years. In recent times the deadly cyanide of potassium, used ostensibly for rabbits, but often purposely for wild life, has resulted in much killing of the opossum. It is highly probable that one of the chief factors contributing to the recent increase of the blowfly pest has been the presence of myriads of decomposing rabbit carcases. An endeavour has been made to ascertain to what extent this is true, but closer investigation is required.

The important bearing of the trade in rabbit skins upon the promotion of certain methods of destruction has been already emphasized. The widespread use of the steel 'gin' trap, and of such baits as strychnine and jam, strychnine and thistle-root, is to be attributed to the value of the skins rather than to the particular utility of those methods as means of eradication. In the 10 years from 1915 to 1924 157½ millions of frozen rabbits were exported from Australia, of which 124½ millions came from New South Wales. In the same period there were exported 717,086,184 skins of which New South Wales sent 539,687,880.

D.G.S.

Racing. According to the *Sydney Gazette* horse-racing was the leading feature at a sports meeting held at Parramatta on 30 April 1810. In a race between horses named Parramatta and Belfast, Parramatta won, and Miss Kitty was victorious in a trotting race. This is the first record of Australia's national sport.

Regular racing was started by the officers of the 73rd regiment. They obtained use of the northern portion of the land now known as Hyde Park, Sydney, and fatigue parties from the regiment formed the track, which was laid out from Market-street to St. James's-road and thence past St. Mary's to Park-street; the home turn was into Elizabeth-street, and the winning post about the end of Market-street. Here, on 15, 17, and 19 October 1810, was held the first regular race-meeting. The acting stewards were Colonel Maurice Charles O'Connell, Lieutenant Thomas Wright, Simeon Lord, and Francis Williams, with John Reddington as clerk of the course. The opening race was for a plate of 50 guineas, given by subscribers to the Sydney race-course, for all horses belonging to subscribers. The best of three two-mile heats—two-years-olds to carry 6 st. 2 lb.; three years, 6 st. 12 lb.; four years, 8 st.; five years, 8 st. 8 lb.; six years, 8 st. 12 lb.; and aged, 9 st. The winner of the first two heats was Captain Ritchie's gray gelding Chase; Williams's roan gelding Strawberry was second in each heat, and Major Cleaveland's chestnut gelding Ratler also ran. On the second day Chase won a Cup valued at 50 guineas (given by the ladies of the colony); the purse given by the magistrates of the colony went to John Benn's black horse Scratch on the third day. Several private

matches were run off at the same time, D'Arcy Wentworth's Gig beating W. Broughton's Jerry in a three-mile race for 60 guineas. On the second day they met again for 40 guineas, and Gig won; on the third day he won again, his rider being William Charles Wentworth. That the horses of those days could stay over a distance was shown by such matches as one from the Rose Inn in Castlereagh-street, Sydney, to a house at Parramatta, in which a horse named Scrap won from his opponent by a mile.

From 1810 to 1814 race-meetings were held annually, but the departure of the 73rd regiment to Ceylon on 26 March 1814 put a stop to them until 17 April 1819, when the governor gave permission for a day's racing. Rob Roy won a silver cup, and T. Cribb's Sly-boots took a silver bowl, cover, and ladle, in the second race; a London-made saddle and bridle, prizes for the third race, went to R. Campbell's Speedy. This horse, Rob Roy, and Haphazard were the principal winners at a meeting in 1820, and in 1821 Rob Roy was again to the fore—which shows that he must have been well bred. In 1822-4 there is no record of racing in the metropolitan area, but on 17 March 1825 the Hibernians held the first St. Patrick's Day races in Australia. This meeting was held on a new course, apparently a portion of the old South Head-road, near Bellevue Hill. The opening event, a subscription purse of 100 dollars, was won by J. Wright's Kitty, and H. Badgery's Hector won the second race, a purse of 60 dollars. On the 18th was formed the first race-club in Australia, the Sydney Turf Club. The first racing under regular club management was on 25 April, Wentworth's Speedy winning the opening event—a ladies' purse; heats, once round; the second race, the Town Plate, introduced a horse destined to become one of the most notable performers on the Australian turf—W. Nash's bay gelding Junius. The added money to the Town Plate was 50 sovereigns, heats, twice round, and Junius, ridden by James Spinks, won both heats easily. On the second day Junius won the Magistrates' Plate of 50 sovereigns, and Hector the Jockey Club Plate.

From this time onwards the sport became established. The Sydney Turf Club held its second race-meeting in Hyde Park on 23, 24, and 25 September 1825, including in the programme a sweepstakes (six furlongs) for two-year-olds, of three guineas each, with ten guineas added, which was won by Henry Bayley's Australian. At this meeting was run off the first handicap in the colony, a sweepstakes of five guineas each, with ten guineas added; it attracted 20 entries, and was won by C. H. Nicholls's Captain, 7 st. 7 lb. Junius was the hero of the meeting, winning the Town Plate and Town Purse (handicap) at 9 st. 10 lb. Unfortunately he fell in the Jockey Club Plate, the winner of which was Currency Lass, a two-year-old who won the last two of five heats. Bayley's useful horse Traveller won the final handicap at this meeting, and on 7 October the Ladies' Purse at a meeting held at Parramatta; Slender Billy, a stable mate of Junius, won the Jockey Club Plate, and soon afterwards was matched against Traveller—who won, then saddled up again and won the Town Plate. The winning of a purse, presented by the governor, by Isaac Gorrick's Prince, brought the meeting to an end.

Early in 1826 the Turf Club secured a new site about four miles from Sydney on the Parramatta-road, in the vicinity of Grose Farm (where the university buildings now stand). The work of forming the race-track was so heavy that racing had to be postponed till 14 June, when 2000 people witnessed Junius win the opening event—Brisbane Cup, heats, twice round, weight-for-age. W. C. Wentworth won a 50-sovereigns sweepstakes, mile heats, with Don Giovanni, and Colonel Dumaresq's Modus took the Turf Club's subscription purse. On the second day backers laid 2 to 1 on Junius winning the Town Plate, which he did easily. In April of the following year he again won the Brisbane Cup, and walked over for the Town Plate. His legs, however, were not sound, and condition failed him in the Brisbane Cup of 1828, in which he was beaten by George Brown's black horse Scratch; but the race and work so improved him that he defeated Scratch a week later. Little was seen of him in public after this, though his sporting owner offered, when he had only three sound legs, to race Scratch for £500 a side; the offer was not accepted, and Junius was turned out in the paddock, but stabled at night. One night in August 1831 the stables (situated just outside Parramatta) caught fire, and Junius and Laurel were so badly burnt that they died.

As the country districts became populated racing extended to them. One of the first race-fixtures outside the metropolis was held in August 1827 at Campbelltown; there were three events, one for a purse of 50 sovereigns. Parramatta held a two-days' meeting in October, where the Town Cup, of 50 sovereigns, heats, twice round the course, was run off. A curious condition was attached to the race—that the winner should be sold on demand for 200 guineas, the Cup to be included in the sale. Scratch won this race, and on the second day the Australian Youths' Stakes of 25 guineas; Australian won the Promoters' Plate and walked over for the Handicap Sweepstakes. In 1828 at the Sydney Turf Club's meeting in April Scratch won the Brisbane Cup and Australian (who had been purchased by C. D. Moore for 210 guineas) the Town Plate. At a dinner after the racing, remarks were made which so offended Governor Darling that he withdrew his patronage, and members of the public service not only resigned from the Turf Club, but decided to form another club; thus began the Australian Racing and Jockey Club, with the governor as patron. Soon after its formation Darling intimated that it was his intention to present a cup, to be run for annually. The new club made the mistake of not securing a course of its own, the Turf Club would not grant the use of the one at Grose Farm, and therefore the new club's first meeting, on 1 and 3 October, was held on the local track at Parramatta. W. Lawson won the Governor's Cup (heats, twice round the course, gentleman riders) with Spring Gun; Australian won a sweepstakes on the first day, and the Town Plate and Handicap Sweepstakes on the second—which made his eighth successive win. W. Lawson, junior, rode Spring Gun in the Cup. On the second day Spring Gun in a great race for the Town Plate narrowly defeated the Windsor champion, Scratch—who was also beaten in a handicap sweepstakes by Crowcatcher. In the following July, however, Scratch won the first event of the Hawkesbury meeting, beating Abdallah and Milo in the Stewards' Cup of £50; he was also returned winner of a Subscription Stakes—a filly named Chance came in first, but a protest against her for wrongful entry was

uphold, the stewards decided to run the race over again, with the filly a non-starter, and Scratch was first past the post. At a meeting of the 'Governor's Club,' at Parramatta, in September, Scratch lost the first heat of the Town Plate to Abdallah, but won the next two heats, and at the Sydney Turf Club's meeting in April 1830 won his last race, the Town Plate, amid great cheering. In August 1831 this famous Windsor champion died from heart-failure while being exercised on the Maitland-road.

Heavy Hawkesbury floods in 1830 prevented a large attendance at the annual meeting of the Sydney Turf Club in April, at which Bennelong won the fifth Brisbane Cup, beating Counsellor, Sir Hercules, Chase, and Scratch. Spring Gun, the two-year-old Manfred (owned by J. B. Bettington), and Abdallah were all good performers at this meeting, at which a match for £150 a side between Sir John Jamison's Sailor Boy and G. Thomas Savage's Sir John was won by the latter. In October the Australian Jockey and Racing Club ran off a meeting at Parramatta, when Counsellor won the Patron's Cup for colonial-bred horses; he was by Camerton, as was also Tomboy, winner of the Maiden Plate. Racing in 1831 was, as usual, conducted by the two regular clubs; a subscription meeting was held at Parramatta, and another on the Killarney course near Richmond, then the most beautiful in the colony. The first race on it, a Publicans' Cup of 50 guineas, was won by Henry Bayley's Tomboy, and the Scarvell Cup was won by John Warby's Sovereign. Early in 1832 those interested in the Sydney Turf Club decided to race in future at Parramatta, owing to the wretched state of the track at Grose Farm. Wentworth was elected president; the newly arrived governor, Sir Richard Bourke, refused to act as patron on the plea that he never kept racehorses, but presented a cup, which was eventually won by S. Icely's Chancellor. Counsellor was beaten in the Wentworth Purse by Lady Emily, a daughter of Manfred, who also won the Members' Purse; Chancellor won the Brisbane Cup. This meeting was the most successful held up to that date in the colony. Chancellor, the winner of the Bourke and Brisbane cups, was bred by Icely by Steeltrap from Minto; Lady Emily (imp.) was by Manfred, full sister to the English horse, Doctor. After the meeting Chancellor was sold to Dr. Fattorini for 250 guineas. Bennelong, mentioned previously, was by Hector from an imported Arab mare.

In the 1830s steeplechase racing was in favour. A steeplechase over five miles of ground between Coogee and Botany was run on 25 August 1832, one condition being that the owner of the last horse should forfeit £5 to the winner; J. Williams's Thiefcatcher, ridden by Captain G. Deedes of the 17th regiment, won by a neck from E. Deas Thomson's Tam O'Shanter, with his owner up. A second steeplechase in September, over a course near Cook's River, was won by Tam O'Shanter. On 12 October 1832 was held the first race-meeting at Liverpool, on a paddock lent by Charles Throsby. C. Roberts won the Members' Purse with his bay mare Selina, and Throsby's Whitefoot beat C. H. Jenkins's Fidget in the Ladies' Purse. The death of Chancellor was announced on 7 December.

Though not then considered important, the sanctioning by the governor of a reserve on what was then termed the Botany-road was one of the most notable events in Australian racing. The *Sydney (Morning) Herald* of 28 January 1832 stated that this reserve was for a new race-course, and the governor authorized the lending of 20 labourers to assist in its formation; so well was the work performed, that a match for £30 a side was run off on 15 April, Edward Fagan's horse defeating one owned by Thomas Smithers. This was really the first race run over what was afterwards known as the 'old sandy track,' which eventually developed into Randwick race-course. The spring race-meeting of 1833 was run off on 17 and 19 April; the track was very heavy, as it had not been sodded. Henry Bayley won the Governor's Cup with Whisker (imp.), from Woodbine by Comus—a three-year-old which also won the Ladies' Purse; other winners were: Trial Stakes, Henry Badgery's York; Maiden Plate, William Smith's Chester; Town Plate, same owner's Emancipation; Handicap, Chester. Poor sport was witnessed in October at Windsor, where Emancipation, Firelock, Lady of the Lake, Chester, and Ironbark were winners. Emancipation also won the Town Plate at the October Parramatta meeting.

Early in 1834 both the race-clubs were dissolved, and racing in the metropolis was carried on by subscription. At a poorly-supported meeting on 30 April and 2 May Chester won the Subscription Cup and Publicans' Purse, Whisker took the Ladies' Purse and Town Plate, and Traveller the Two-year-old Stakes. A Governor's Cup run for at Maitland on 15 July was won by G. W. Simpson's Pitch. On 20 August the annual steeplechase over a three-miles course with nine 4-foot three-rail fences and a hedge and ditch was run in wet weather and won by Captain P. J. Petit's Waxy, ridden by Ensign R. Waddy. The Cumberland Turf Club held its first meeting at Campbelltown on 21 and 22 October, when William Howe's Forrester won the Members' Cup. The Illawarra Turf Club, which carried on racing at Wollongong for about 40 years, was formed in 1834; the first meeting at Patrick's Plains was held in September 1835, when Countess, by Mantrap —considered the best mare of her inches in the colony—won the Patrick's Plains Purse. She had previously won the Hunter River Stakes at Maitland. The annual subscription races were held on the new course. In the same year were imported two English racehorses, Gratis by Middleton-Lanica, and Velocipede, a gray, by Velocipede-Jane. In 1836 the Sydney subscription races were held on the old course, and again in 1837—when Traveller won the sweepstakes of £10, with £75 added, and the Town Plate. Hurdle and steeplechase racing was held as usual at Randwick. Country racing was in a flourishing state in 1837; the added money at a two days' meeting at West Maitland was £300, at Patrick's Plains £240, and at Windsor £175. In March 1838 the added money at the Bathurst subscription races was £135, and there were 24 starters for the Bathurst Plate of £75, won by J. Nobel's Flirt. There was also a hurdle race, won by Ensign Waddy's Dr. Syntax. Though the track at Sydney was in a wretched state, a subscription meeting was held on it, C. Smith's Chester being the principal performer.

In 1840 the old order of racing passed away. An 'Australian Race Committee' was formed, including Captains Hunter, O'Connell, and Westmacott, Lieutenants Price and Chambre, W.

Lawson (senior), H. H. Kater, R. Scott, G. Way, G. K. Holden, P. J. Campbell, and R. Anderson. They decided on a course at Homebush, and held the first meeting on 16 and 18 March 1841. The officials were: stewards, P. T. Campbell, R. Scott, H. H. Kater, Captain O'Connell; judge, Captain Hunter; clerk of the course, A. Way. The Metropolitan Cup was won by G. Hall's Hercules, the St. Leger (a sweepstakes of 10 sovereigns with 200 sovereigns added) by R. Rouse's Eleanor. The committee held three meetings at Homebush, and was then merged in the Australian Jockey Club, whose first meeting was held at Homebush on 20, 21, and 22 September 1842. The first day's programme comprised the Champion Cup (heats), C. Smith's Eclipse 1, Sir J. Jamison's Sir Charles 2; Two-year-old Stakes, Major Hunter's Marchioness 1, C. Roberts's President 2, J. Abercrombie's Mozart 3; Australian Stakes (heats), C. Smith's Tranby 1, C. Roberts's Eucalyptus 2; Maiden Plate (w.f.a., 1½ miles), W. Oakes's Little Wonder 1, C. Smith's Chillington 2. On the second day C. Smith's Eclipse won the Tradesman's Purse, and Major Hunter the Hack Race. On the third day were run the Champagne Stakes, C. Roberts's Quail walked over; Ladies' Purse, Sir J. Jamison's Sir Charles 1, C. Roberts's Plutus 2; Claret Stakes, C. Smith's Tranby 1, C. Roberts's Eucalyptus 2; Beaten Stakes, C. Roberts's Plutus 1. The club continued racing at Homebush until 1859, during which period it gave away in added money stakes to the value of £13,232 10s.; it continued the St. Leger Stakes, winners of which were Eleanor, Beeswing, Marchioness, Blue Bonnet, Peter from Athlone, Lady Theorem, Whalebone, Snake, Pastile, Cossack, Plover, Surplice, Cooramin, Venison, Camden, Stumpy, Lauristina, Chevalier, and The Don. In 1851 the legislative council voted £100 as a prize for a special race at Homebush, entitled the Queen's Plate, 3 miles; this was run on 30 May 1851, and won by two lengths in 6 minutes 5 seconds by J. Tait's ch. c. Cossack, by Sir Hercules-Flora M'Ivor, 4 years, 9 st. 2 lb. (J. Cutts); the second horse was J. De Clouett's Little John, aged, 10 st. 4 lb. (Matthews), and the third J. Roberts's Plover, 5 years, 10 st. (J. Higgerson). Vanity, Sappho, Bay Lottery, Lieutenant, and Waxford also started. Cossack won also in 1852, Sportsman in 1853 and 1854, Vanguard in 1855, and Cooramin in 1856. In 1857 the new legislative assembly rejected the vote, and the Australian Jockey Club substituted an Australian Jockey Club Plate, won by G. T. Rowe's Veno. On 30 May and 1 and 2 June 1859 the A.J.C. held its last race-meeting at Homebush, and started racing at Randwick on 29, 30, and 31 May 1860. At this meeting only two started for the first race—Second Triennial Stakes, won by J. K. Cleeve's Chatteress, J. Tait's Alfred was the other starter. Veno (ridden by John Higgerson) won the Australian Plate, from a New Zealand horse Strop (John Cutts); T. Driscoll's Planet won the Metropolitan Maiden Plate; T. Ivory's Flying Doe the Squatters' Purse; and W. Towns's Stranger Tattersall's Free Handicap. On the second day the first Triennial Stakes were won by J. J. Roberts's Moss Rose; the Publicans' Purse by W. R. Blackman's True Blue; the Welter Race by T. M'Guire's Egremont; the City Plate by J. J. Roberts's Gratis; and the Hack Race by J. Taylor's Pussy Cat. The third day's winners were—Prince of Wales' Stakes, T. Ivory's Euroka; Randwick Plate, A. Loder's The Don; A.J.C. Handicap, J. J. Roberts's Gratis; Consolation Stakes, J. Onus's Ackbar; Forced Handicap, J. Driscoll's Planet. The added money at this meeting was £1335.

SYDNEY CUP WINNERS (2 miles).

Year.	Winner.	Age.	Weight.	Starters.	Rider.	Time.
			st. lb.	No.		m. sec.
1866	Yattendon ...	4	8 4	13	S. Holmes ...	3 43
1867	Fishhook ...	3	6 10	15	S. Davis ...	3 41½
1868	The Barb ...	4	8 12	11	C. Stanley ...	3 40
1869	The Barb ...	5	10 8	16	J. Ashworth ...	3 40
1870	Barbelle ...	4	7 10	17	S. Davis ...	3 43
1871	Mermaid ...	4	7 5	12	J. Wilson ...	3 40
1872	The Prophet ...	3	6 10	16	M. Thompson ...	3 36¾
1873	Vixen	4	7 2	18	W. Duggan ...	3 40
1874	Speculation ...	3	6 2	25	W. Duggan ...	3 39
1875	Imperial ...	5	7 9	16	H. Lewis ...	3 36
1876	A.T.	4	6 4	15	P. Pigott ...	3 37¾
1877	Kingfisher ...	a.	7 5	19	W. Huxley ...	3 36¼
1878	Democrat ...	4	6 5	15	J. Sealy... ...	3 33 6/10
1879	Savanaka ...	4	8 7	15	T. Hales ...	3 33 8/10
1880	Petrea	3	7 12	26	T. Hales ...	3 37½
1881	Progress ...	3	8 2	16	T. Hales ...	3 36 7/10
1882	Cunnamulla ...	3	6 0	19	S. Cracknell ...	3 34
1883	Darebin... ...	4	9 8	15	R. O'Connor ...	3 33¼
1884	Favo	5	6 4	21	J. Smith ...	3 30
1885	Normanby ...	5	6 10	28	D. Nicholson ...	3 35
1886	Cerise and Blue	4	8 2	25	B. Colley ...	3 33¼
1887	Frisco	3	6 1	19	—. Argall ...	3 39¾
1888	Australian Peer	3	8 6	10	E. Power ...	3 32½
1889	Carbine ...	3	9 0	13	M. O'Brien ...	3 31
1890	Carbine ...	4	9 9	15	M. O'Brien ...	3 37
1891	Highborn ...	5	9 3	14	Jno. Gough ...	3 37½
1892	Stromboli ...	3	8 0	22	E. Huxley ...	3 31½
1893	Realm	5	8 5	23	E. Hodgson ...	3 39
1894	Lady Trenton ...	4	7 7	24	W. Delaney ...	3 34
1895	Patroness ...	3	7 0	22	H. Cook ...	3 38½
1896	Wallace ...	3	8 12	22	Jas. Gough ...	3 31
1897	Tricolor ...	5	6 10	23	J. M'Curley ...	3 31½
1898	Merloolas ...	6	7 8	18	W. H. Smith ...	3 31
1899	Diffidence ...	3	6 8	23	E. Turner ...	3 31
1900	La Carabine ...	5	8 2	21	W. Burn ...	3 31½
1901	San Fran ...	3	6 12	15	F. Hickey ...	3 32
1902	Wakeful ...	5	9 7	20	F. Dunn ...	3 28
1903	Street Arab ...	5	6 12	18	F. Hickey ...	3 31¾
1904	Lord Cardigan	3	8 7	16	J. Barden ...	3 31¾
1905	Tartan	4	7 13	28	J. Rogers ...	3 27
1906	Noreen	4	6 7	19	D. Callinan ...	3 29¼
1907	Realm	6	7 10	11	C. Cooper ...	3 29
1908	Dyed Garments	a.	7 4	17	G. Ross ...	3 34
1909	Trafalgar ...	3	7 11	17	W. H. Smith ...	3 29½
1910	Vavasor ...	4	7 9	20	W. H. M'Lachlan	3 29½
1911	Moorilla ...	3	7 1	28	F. Hood ...	3 36½
1912	Saxonite ...	5	8 7	26	G. Lambert ...	3 29
1913	Cadonia... ...	5	9 1	26	S. M'Donald ...	3 28½
1914	Lilyveil ...	5	8 8	19	W. H. M'Lachlan	3 26½
1915	Scotch Artillery..	5	7 2	20	F. Hood ...	3 36½
1916	Prince Bardolph	4	7 3	26	G. Meddick ...	3 24¾
1917	The Fr'tne Hn'tr	5	8 6	17	A. Wood ...	3 26
1918	Rebus	4	7 12	20	C. O. Davies ...	3 26½
1919	Ian'or	6	6 10	18	T. F. M'Namara	3 31½
1920	Kennaquhair ...	5	9 5	20	A. Wood ...	3 22¾
1921	Eurythmic ...	4	9 8	17	F. Dempsey ...	3 24¾
1922	Prince Charles ...	4	7 11	21	J. Munro ...	3 26½
1923	David	5	9 7	23	A. Wood ...	3 26½
1924	Scarlet	4	7 6	21	J. Crowe ...	3 28½
1925	Lilypond ...	4	9 0	23	W. Duncan ...	3 26¾
1926	Murray King ...	5	7 2	21	E. M'Namara ...	3 26

The Australian Jockey Club established some rich stakes at Randwick. The Australian Derby Stakes was in 1925 the richest classic race in the Commonwealth, receiving in added money £8000. There were 570 entries, seven starters, B. Chaffey's Manfred winning in 2 min. 35¼

sec.; value of stake to winner £6226 17s. Other rich stakes have been a Breeders' Plate of £2000; Gimcrack Stakes, £2000; December Stakes, £2000; Adrian Knox Stakes, £1500; Sires' Produce Stakes, £5000; St. Leger, £2500; Champagne Stakes, £3000; Epsom Handicap, £3000; Metropolitan, £6000; Doncaster Handicap, £3000; Sydney Cup, £6000.

The Sydney Cup is the leading event of the A.J.C. autumn meeting. Established in 1866, it was then worth £444 to the winner; in 1925 the winner received £5233. In the 1866 race the place-getters and starters were:—Merry's br. h. Yattendon, 4 years, 8 st. 4 lb. (S. Holmes) 1; T. Ivory's ro.m. Sultana, 4 years, 7 st. 1 lb. (J. Fuller) 2; J. Tait's ch.g. Falcon, 4 years, 7 st. 5 lb. (H. Martineer) 3; Tarragon, Canobie, Sir Patrick, O'Meara, Forrester, Union Jack, Potentate, The Pitsford, Angler, Rose of Australia. It was won by a length; time, 3 min. 43 sec.

Racing in *Victoria* commenced on a course at Batman's Hill (Melbourne) in 1838; no record of the meeting is known to be extant. In February 1839 a second meeting was held; the programme comprised Town Plate, won by J. Procor's Mountain Maid; Hurdle Race, Bateman's Postboy; Squatters' Purse, J. Procor's Mountain Maid. From 1840 onwards racing took place at Flemington, but until 1846 was confined to local horses. At the March meeting of 1840 was run the Town Plate of 50 sovereigns (w.f.a., heats, 2 miles and a distance); it was won by C. Campbell's four-year-old Petrel. In 1847 Bunyip was the winner; the racing was carried out by the Victoria Turf Club, which in 1850 instituted the V.T.C. St. Leger, won by G. Main's Dinah. The V.T.C. also established a Derby in 1855, won by E. Rowe's Rose of May. Flying Doe won in 1856. In 1857 the Victoria Jockey Club was formed, and a Derby was won by Tricolor; Union Jack won the Turf Club's Derby. At the spring meeting of 1857 Alice Hawthorn won the Great Australian Sweepstakes. A challenge was thereupon issued:—Victoria is open to run a horse bred in that colony, 3 miles, w.f.a., against any horse bred in New South Wales, for 1000 sovereigns a side. The challenge was accepted by G. T. Rowe, owner of Veno, and on 3 October 1857 Veno (J. Higgerson) won easily by two lengths at Flemington in 6 min. 12 sec. In a second match for £400, G. T. Rowe's Cooramin (J. Higgerson) beat Fraser's Tomboy (R. Mitchell); a third match, G. T. Rowe laying £500 to £400, was won easily by Veno (J. Higgerson) from Van Tromp (S. Mahon). These matches brought about in 1859 the Champion Race, a sweepstakes of 100 sovereigns each (h.ft., 500 sovereigns added, w.f.a.; 3 miles), which was won by W. C. Yuille's Flying Buck (H. Yeend) in 5 min. 57½ sec. In 1860 a Champion Race run at Randwick was won by J. Tait's Zoe, who also won the third, run later in 1860 at Ipswich in Queensland. Under the name of Champion Stakes the race was continued till 1915, and then as the King's Plate, 2 miles.

On 7 November 1861 the first Melbourne Cup was run at Flemington. The conditions were: sweepstakes of 20 sovereigns, 10 sovereigns forfeit or 5 sovereigns if declared, with 200 sovereigns added by the Victoria Turf Club; 2 miles. Place-getters and starters were:—E. De Mestre's b.h. Archer, 5 years, 9 st. 7 lb. (J. Cutts) 1; J. Henderson's ns. br.h. Mormon, 6 years, 10 st. (W. Simpson) 2; W. Pearson's bl.g. Prince, aged, 8 st. (J. Bishop) 3; B. Warby's Antonelli, 6 st. 7 lb. (Cowan); T. Bavin's Flatcatcher, 9 st. 3 lb. (Perkins); G. Watson's The Moor, 8 st. 12 lb. (S. Waldock); J. Henderson's Despatch, 8 st. 9 lb. (J. Morrison); E. De Mestre's Inheritor, 8 st. 7 lb. (W. McCabe); J. Cold-

MELBOURNE CUP WINNERS (2 miles).

Year.	Winner.	Age.	Weight.	Starters	Rider.	Time.
			st. lb.	No.		m. sec.
1861	Archer ...	5	9 7	17	J. Cutts...	3 52
1862	Archer ...	6	10 2	20	J. Cutts...	3 47
1863	Banker ...	3	5 4	7	—. Chiffney	3 44
1864	Lantern...	3	6 3	19	S. Davis	3 55
1865	Tory Boy	a.	7 0	23	—. Kavanagh	3 44
1866	The Barb	3	6 9	28	W. Davis	3 43
1867	Tim Whiffler	5	8 11	27	J. Driscoll	3 39
1868	Glencoe	4	9 1	25	C. Stanley	3 42
1869	Warrior	6	8 10	26	J. Morrison	3 40
1870	Nimblefoot	a.	6 3	28	J. Day ...	3 37
1871	The Pearl	5	7 3	23	—. Cavanagh	3 39
1872	The Quack	6	7 10	22	W. Enderson	3 39¾
1873	Don Juan	4	6 12	24	W. Wilson	3 36¼
1874	Haricot	4	6 7	18	P. Pigott	3 37
1875	Wollomai	6	7 8	20	R. Batty	3 38
1876	Briseis ...	3	6 4	33	St. Albans	3 36
1877	Chester ...	3	6 12	33	P. Pigott	3 32
1878	Calamai...	5	8 2	30	T. Brown	3 35
1879	Darriwell	5	7 4	27	S. Cracknell	3 30
1880	Grand Flaneur	3	6 10	22	T. Hales	3 34½
1881	Zulu ...	4	5 10	33	—. Gough	3 32
1882	The Assyrian	5	7 13	25	—. Hutchens	3 40½
1883	Martini-Henri	3	7 5	29	—. Williamson...	3 30¾
1884	Malua ...	5	9 9	24	A. Robinson	3 31½
1885	Sheet Anchor	a.	7 11	35	M. O'Brien	3 29
1886	Arsenal	4	7 5	28	W. English	3 31¼
1887	Dunlop ...	5	8 3	18	T. Sanders	3 28½
1888	Mentor	4	8 3	28	M. O'Brien	3 30¾
1889	Bravo ...	6	8 7	20	—. Anwin	3 32½
1890	Carbine	5	10 5	39	R. Ramage	3 28½
1891	Malvolio	4	8 4	34	G. Redfern	3 29¼
1892	Glenloth	5	7 13	35	—. Robson	3 36¼
1893	Tarcoola	a.	8 4	30	—. Cripps	3 30½
1894	Patron ...	4	9 3	28	—. Dawes	3 31
1895	Auraria	3	7 4	36	—. Stevenson	3 29
1896	Newhaven	3	7 13	25	—. Gardiner	3 28½
1897	Gaulus ...	6	7 8	29	S. Callinan	3 31
1898	The Grafter	5	9 2	28	Jn. Gough	3 29¾
1899	Merriwee	3	7 6	28	V. Turner	3 36¼
1900	Clean Sweep	3	7 0	29	—. Richardson...	3 29
1901	Revenue	5	7 10	19	F. Dunn	3 30½
1902	The Victory	4	8 12	22	R. Lewis	3 29
1903	Lord Cardigan	3	6 8	24	N. Godby	3 29½
1904	Acrasia ...	a.	7 6	34	T. Clayton	3 28½
1905	Blue Spec	6	8 0	27	F. Bullock	3 27½
1906	Poseidon	3	7 6	21	T. Clayton	3 31½
1907	Apologue	5	7 9	19	W. Evans	3 27½
1908	Lord Nolan	3	6 10	22	J. R. Flynn	3 28¾
1909	Prince Foote	3	7 8	26	W. H. M'Lachlan	3 27½
1910	Comedy King	4	7 11	30	W. H. M'Lachlan	3 27¾
1911	The Parisian	6	8 9	33	R. Cameron	3 27½
1912	Piastre ...	4	7 9	23	A. Shanahan	3 27¾
1913	Posinatus	5	7 10	20	A. Shanahan	3 31
1914	Kingsburgh	4	6 12	28	G. Meddick	3 26
1915	Patrobus	3	7 6	24	R. Lewis	3 28½
1916	Sasanof	3	6 12	28	F. Foley	3 27¾
1917	Westcourt	5	8 5	20	W. H. M'Lachlan	3 26¾
1918	Nightwatch	5	6 9	27	W. Duncan	3 25¾
1919	Artilleryman	3	7 6	20	R. Lewis	3 24½
1920	Poitrel ...	6	10 0	23	K. Bracken	3 25¾
1921	Sister Olive	3	6 9	25	E. O'Sullivan	3 27¾
1922	King Ingoda	4	7 1	32	A. Wilson	3 28½
1923	Bitalli ...	5	7 0	26	A. Wilson	3 24½
1924	Backwood	6	8 2	18	P. Brown	3 26½
1925	Windbag	4	9 2	28	J. Munro	3 22¾

ham's Twilight, 7 st. 12 lb. (R. Haynes); J. Coldham's Grey Dawn, 7 st. 12 lb. (H. Yeend); W. C. Yuille's Toryboy, 7 st. 11 lb. (Cooke); J. Hume's Black Bess, 7 st. 11 lb. (J. Monaghan); J. Henderson's Medora, 7 st. (J. Henderson); J. Henderson's Sorcerer, 6 st. 9 lb. (Hughes); W. C. Yuille's Eagle's Plume, 6 st. 7 lb. (Lankey); Cole's Fireaway, 6 st. 6 lb. (Howard); E. Coleman's Lucy Ashton, 6 st. 4 lb. (S. Davis). Eagle's Plume weighed out but did not start. Archer won easily in 3 min. 52 sec. An accident caused Medora, Despatch, and Twilight to fall.

In 1861 the first race for the Oaks Stakes was run, and was won by George Watson's Palestine; the first Australian Cup was won in 1863 by J. Harper's Barwon. In 1864 the Victoria Racing Club was formed, and took over the management of the great Victorian races, adding in 1871 the Maribyrnong Plate for two-year-olds, won by J. Thompson's Argus Scandal, and in 1874 the Newmarket Handicap, won by Dr. Bathe's Maid of Avenal. The Victoria Amateur Turf Club, whose grounds are at Caulfield, south of Melbourne, began its career in 1878 and on 5 April 1879 ran off the first Caulfield Cup, won by A. Chirnside's Newminster. In 1881 the club introduced the Caulfield Guineas, won by Captain Osborne's Wheatear, and the Debutante Stakes, won by W. Pearson's Fryingpan; in 1898 it added the Caulfield Futurity Stakes, won by W. R. Wilson's Resolute. Among other important Victorian races the first Geelong Cup was won in 1872 by Flying Scud, the first Moonee Ponds Cup in 1883 by R. McKinley's Castaway, and the first Williamstown Cup in 1888 by S. G. Cook's Mara.

Racing in *Adelaide* began in 1838, the first race being won by J. H. Fisher's Black Jack. The first winner of the Adelaide St. Leger (1855) was J. Harvey's Beda. C. B. Fisher's Midnight won the first South Australian Derby in 1860, and W. Dowling's Falcon the first Adelaide Cup in 1864. *Western Australia's* leading handicap—the Perth Cup—first run for in 1879, was won by Corisande. Racing in *Queensland* was firmly established in 1866, when T. F. Ryan's Forester won the first Brisbane Cup; in 1868 the Queensland Derby was introduced, and won by W. E. Parry-Oakden's Hermit; T. Dwyer's Premier won the first Queensland Cup in 1878, and J. P. Bell's Waterloo the first Queensland St. Leger in 1881. Other Queensland races of note are the Toowoomba Club Handicap, first won by W. Wildash's Zanco in 1873; the Gympie Turf Club Handicap (J. Nolan's Mistake, 1874), the Rockhampton Handicap (W. Callaghan's Kingston, 1875), and the Maryborough Jockey Club Handicap (W. H. Kent's The Dirk, 1875). In *Tasmania* racing was firmly established in 1831. The chief races are the Launceston Cup (S. Blackwell's Panic, 1865), the Hobart Cup (P. Lewis's Ella, 1875), the Derwent Plate (W. Brown's Southern Cross, 1876), and the Carrick Plate (T. Armstrong's Happy Jack, 1877).

The time-records of to-day show a marked improvement on those of 50 years ago. In 1875 Richmond won the A.J.C. Derby in 2 min. 45 sec.; in 1925 Manfred's time was 2 min. 35¼ sec. In 1875 Wollomai won the Melbourne Cup in 3 min. 38 sec.; in 1925 Windbag's time was 3 min. 22¾ sec. At other distances the difference is quite as pronounced. The Epsom Handicap of 1876 (one mile) was run in 1 min. 45½ sec.; that of 1925 in 1 min. 37¾ sec. The All-Aged Stakes of 1876 (one mile) was run in 1 min. 46¼ sec.; in 1925 the Linlithgow Stakes in 1 min. 37 sec. over the same distance. The fastest times recorded in the Commonwealth for 1925 are as follows:—

Distance.	Time.	Horse.	Age.	Weight.	Locality.
	m. sec.			st. lb.	
4½ furlongs ...	0 54½	Woorak	2	8 0	Randwick (N.S.W.).
5 furlongs ...	0 59	St. Speed ...	6	8 4	Cheltenham Park (S.A.).
		St. Roseate ...	6	8 10	Cheltenham Park.
5½ furlongs ...	1 6¼	Poitrina ...	4	8 11	Caulfield (Vic.).
7 furlongs ...	1 24½	Remmon ...	6	7 12	Randwick.
		Boaster ...	3	8 13	Randwick.
		Irish Prince ...	4	7 3	Randwick.
1 mile ...	1 36½	The Hawk ...	6	8 12	Flemington (Vic.).
9 furlongs ...	1 50¼	Heroic	3	8 2	Randwick.
1¼ miles ...	2 3½	Beauford... ...	5	9 1	Randwick.
11 furlongs ...	2 17½	Tom McCarthy ...	a.	9 3	Brisbane (Q.).
1½ miles ...	2 30½	Wedding Day ...	6	7 12	Randwick.
1 mile 5 fur. ...	2 43½	Sir Andrew ...	4	8 6	Randwick.
1¾ miles ...	2 58¼	The Cypher ...	3	7 9	Flemington.
2 miles ...	3 22¾	Kennaquhair ...	5	9 5	Randwick.
		Windbag ...	4	9 2	Flemington.
2¼ miles ...	4 39⅞	Trenton	4	9 0	Flemington.
3 miles ...	5 22¼	Trafalgar ...	5	9 5	Randwick.

At Flemington, Caulfield, and Newcastle, the timing of races is done by an electric chronograph.

Stakes have increased enormously during the last 50 years, especially since 1900. In that season the Victoria Racing Club gave in added money to their nine race-meetings at Flemington £30,682, and the Australian Jockey Club £23,475 to 15 days' racing at Randwick. By 1910 the figures had been increased to £41,177 by the V.R.C., and £44,950 by the A.J.C. From this time onwards the A.J.C. have increased the added money every season. In 1920 the total was £80,560, in the following season £101,500; for the season ending July 1925 the A.J.C. gave £126,325 to 15 days' racing, and the V.R.C. £86,000. In 1907 Tattersall's Club, racing four days at Randwick, gave in added money £4075; in 1925 it contributed £15,600. Eight clubs racing in the Sydney area for 47 days in 1907 paid out £23,275; in 1925 the amount was £228,819 for 60 days' racing. In 1925 the Queensland Turf Club gave in added money £60,257; the Brisbane Amateur Club, £40,631; the Victoria Amateur Turf Club at its spring meeting, £22,150; the Victoria Racing Club at its spring meeting (added money and sweeps), £42,473; the Australian Jockey Club at its spring meeting (added money and sweeps), £56,604.

Outside the metropolitan areas important racing takes place. At Wagga in New South Wales, the first meeting was held in 1849, when T. Hanley's Ajax won a silver cup presented by J. J. Roberts. P. Keighran's Mormon on 16 March 1864 won the Champion Race (sweep of 40 sovs., 1000 sovs. added, 3 miles); on 20 November 1868 a Ten Miles' Race (sweep of 5 sovs., 300 sovs. added, welter weight-for-age) was won by H. J. Bowler's Australian (W. Yeomans) in 23 minutes 35 sec. In 1875 the Wagga Cup (with 1000 guineas added) was won by P. Parslow's Cleolite. At Howlong on 27 June 1876 a 100-miles' race took place; Viking ran 87⅞ miles in less than eight hours, but his opponent, John Sullivan, was pulled up, and the race was not finished. At the 1859 meeting of the Clarence River Jockey Club,

Newbold and Venison won the principal races. Among Australian hurdle-races and steeplechases the principal are:—the Victoria Racing Club's Grand National Steeplechase (first won by Sir Peter in 1866); the Onkaparinga Great Eastern Steeplechase (Tormentor, 1876); the V.R.C. Grand National Hurdle-race (Sir Peter, 1881); and the Australian Hurdle-race (Rhesus, 1882) and Australian Steeplechase (Left Bower, 1882), both run at Caulfield.

Racing in Australia has brought out some great racehorses. In its early history the most prominent performers were Abdallah, Australian, Chance, and Counsellor. In 1825-30 Junius was indisputably the champion; Scratch, and Spring Gun (by Steeltrap), were also notable performers. Next came Jorrocks, a bright bay with black points, the greatest racehorse of his day. Bred by H. Bayley, of Bayley Park near Mudgee, Jorrocks (by Whisker from Matilda, by Steeltrap) was foaled in 1833 but not broken in until he was rising four years old. After acting as a stock-horse he won a 25-sovs. sweepstake, and in 1841 R. Rouse acquired him in exchange for eight springing heifers. On 16 March 1841 at Homebush he finished second to Chestnut Prince in the Ladies' Purse, and thenceforward until 1852 competed on the principal race-tracks of the colony. In all he took part in 90 races, of which he won 65, finishing second in 21. As most of the events were run in heats, Jorrocks did almost 200 miles of racing. In 1852 he ran his last race at Homebush. Dora, foaled in 1848 (by Camel from Annette), took part in 60 races, without a blemish to her legs. On 3 October 1857 at Flemington G. T. Rowe's Veno beat Alice Hawthorn in a match for £2000 and the championship of the turf; Veno had already started in 28 races, winning 23 and coming second in the other 5, and raced with success for some time afterwards. Rowe also raced a famous mare Lauristina, with which in 1858 he beat Veno (who had been sold to J. H. Atkinson for £1000) in a match for £2000—she also won seven other races. Petrel, a dark chestnut foaled in 1842, was the greatest performer of his time in Victoria. In 1860-1 J. Tait's Zoe (by Sir Hercules) was notable, and in 1862 Archer, who won his second Melbourne Cup easily with 10 st. 2 lb. The Barb, who won the A.J.C. Derby and the Melbourne Cup in 1866, the Champion Sweepstakes in 1867, the Metropolitan Stakes and the Sydney Cup in 1868, and the A.J.C. Queen's Plate and the Sydney Cup for a second time in 1869 (with 10 st. 8 lb.), won in all 16 races and £6918 in prize-money. In the 1860s Fishhook, Fireworks, and Panic were also noted performers, and in the 1870s Richmond, First King (twice winner of the Champion Sweepstakes), Wellington, and Chester (by Yattendon), winner of the V.R.C. Derby and Melbourne Cup in 1877; during his racing career Chester won 18 races, worth £8174. In 1880 Grand Flaneur (by Yattendon) was unbeaten; his nine wins included the V.R.C. Normanby Stakes, A.J.C. Derby Mares' Produce Stakes, V.R.C. Derby Mares' Produce Stakes, St. Leger, Town Plate, Melbourne Cup, and Champion Stakes, after which he broke down; his prize-money totalled £7939. The best horses of 1883 were Commotion (by Panic) and Martini-Henry (by Musket). Commotion won 13 races—the Champion Stakes twice; his prize-money amounted to £7700. Martini-Henry won the V.R.C. Derby and Melbourne Cup, and £4751 in stakes. The Melbourne Cup winner of 1884, Malua (by St. Albans) was a remarkable performer. In addition to the Melbourne Cup he won the Newmarket Handicap, the Australian Cup, the Grand National Hurdle Race, and eight others. In 1888 Abercorn won the Champion Stakes and other classic races, and £12,731 in stakes. Carbine (by Musket) was undoubtedly the most popular horse that has raced in Australia. He won the Melbourne Cup in 1890 with 10 st. 5 lb.—the heaviest weight ever carried by a Melbourne Cup winner—against the record number of 39 starters, and in 3 min. 28¼ sec., the fastest time then recorded. During his racing career Carbine started in 43 races, for 33 wins, 6 seconds, 3 thirds, and stakes amounting to £29,626. In 1895 Wallace (by Carbine) won the V.R.C. Derby and seven other races, worth £6116; in 1896 Newhaven won the V.R.C. Derby, Melbourne Cup, and other races, and was then sent to England, where also he had successes; he won in all 19 races, and £13,254 in stakes. In 1906 Poseidon won the A.J.C. Derby, Caulfield Cup, V.R.C. Derby, and Melbourne Cup, a series of victories never before or since achieved by any horse; he took part in 33 races for 19 wins, 4 seconds, 3 thirds, stakes £19,496. About the same time Tartan had 19 wins, worth £9697. Prince Foote won in stakes £16,520; Comedy King, £12,945; Sasanof, £20,770 5s.; Cetigne, £27,206 8s.; Poitrel, £26,920; Eurythmic, £33,066; Trafalgar, £22,111; David, £31,410 10s.; Heroic, £14,616 10s.; Wolaroi, £20,016; and Beauford £17,186. Gloaming, who ran only in classic and weight-for-age races, had 67 starts, 57 wins, 9 seconds, and £43,100 in prize-money. Among mares, Briseis was notable in 1876; Wakeful won 25 races and £16,690 in stakes; but Desert Gold holds the record for mares with 56 starts, 36 wins, 12 seconds, 4 thirds, and prize-money amounting to £23,133. Other good performers were Furious (13 wins, £20,172), Carlita (13 wins, £17,830), Sister Olive (2 wins, £10,841), Gladsome (28 wins, £10,712), Molly's Robe (15 wins, £10,435), Lady Medallist (21 wins, £10,376), Traquette (15 wins, £10,016), La Carabine (15 wins, £7372), and Lady Wallace (14 wins, £7139).

Stakes.—The most valuable stakes are open to the two- and three-year-old classes. The two-year-old division have no fewer than a dozen events, to which the added money ranges from £5000 to £1000, with a great number of races of lesser value. Three-year-olds have a chance to win the A.J.C. Derby, £8000; V.R.C. Derby, £5000; Caulfield Guineas, £3150; A.J.C. St. Leger Stakes, £2500; V.R.C. St. Leger Stakes, £1500; Adrian Knox Stakes, £1500; West Australian Derby, £1300; Rosehill Guineas, £1050; V.R.C. Oaks, £1000; and Hobartville Stakes, £1000. It is these rich stakes that have brought about the sensational prices now given for yearlings. The highest recorded are Orcus, 3050 gs.; King David, 2600 gs.; Lord Randolph, 2300 gs.; Victorian King, 2300 gs.; Titanic, 2150 gs.; Claverite, 2100 gs.; and Duke James, 2100 gs. That the fortunate purchaser of a first-class yearling has a bargain is shown by the winnings, as two-year-olds, of Heroic, £11,801; Thrice, £8972; The Monk, £8213; Furious, £7923; Los Gatos, £7876; Outlook, £7439; Wolaroi, £7215; Woorak, £6317; Cetigne, £5356; and Millieme, £4454. That a three-year-old can win more than at the earlier stages of his career is shown by the doings at that age of Gloaming, £12,176; Furious, £10,319; Whittier, £9678; and Windbag, £8231. The last-

named did even better at four years, winning in his fourth season £18,188, which included the Melbourne Cup. Manfred, as a two-year-old, won £5292, and brought his total up to £14,950 at three years. The leading clubs in Australia have from the earliest days generously supported weight-for-age events, enabling good horses to earn solid prize-money without competing with a heavy weight against inferior animals in handicaps. F.W.

Radio-telegraphy was introduced into England by Marconi in 1896. Nine years later officials of the Marconi Company erected the first wireless stations in Australia, one at Queenscliffe, near Port Phillip Heads in Victoria, the other near Devonport in Tasmania. Excellent communication was established and maintained between the two stations. The apparatus consisted of fixed spark transmitters, using a power of 1½ kilowatts and Marconi magnetic receivers. Wireless communication was officially recognized by the Commonwealth government in the wireless telegraph act in 1905. For some years, however, it was used only in warships on the Australian station and in a few experimental plants erected by scientific workers; as early as 1906 C. P. Bartholomew erected an experimental station at Mosman near Sydney, and established communications by apparatus of his own make. The year 1910 marked a notable advance in Australian radio-telegraphy. In that year the first association of wireless experimenters formed in the British Empire was established in Sydney under the name of 'The Wireless Institute of New South Wales;' its founder, George A. Taylor, devised apparatus that gave free communication both from front to rear of a train and between trains running at full speed; and the federal government, acting on a report from Admiral Henderson, invited tenders for the construction of a wireless telegraph-station at Sydney and another at Perth—each to have a daylight range of 1250 miles. In 1911 a contract was signed with the Gesellschaft für Drahtlose Telegraphie of Berlin (the lowest tenderers) for the construction and erection of these stations; the necessary engineers and apparatus were shipped from Germany, and the stations erected, one at Pennant Hills near Sydney and the other at Applecross near Fremantle, during 1912 and 1913. During 1913 and 1914 a number of smaller stations were erected round the Australian coast at Melbourne, Hobart, Mount Gambier, Port Adelaide, Esperance, Geraldton, Roebourne, Wyndham, Port Darwin, Thursday Island, Port Moresby, Townsville, Cooktown, and Brisbane.

In 1911 George Taylor developed his apparatus in the direction of guiding locomotives by wireless and of transmitting from harbour entrances power that would actuate a fog-horn on an approaching vessel. In 1913 a company was formed, with Australian and English capital amounting to £140,000, to purchase existing and future patent rights of the Marconi and Telefunken systems. This company, Amalgamated Wireless (Australasia) Ltd., has played an important part in the development of wireless communication; during the war it developed the manufacture of apparatus so as to supply, not only all the requirements of the Australasian mercantile marine, but in addition a large number of complete equipments for British vessels built in Japan and China for the British ministry of shipping. The interception of wireless messages from enemy ships at many points in the Pacific, and eventually from European stations in Germany, Italy, France, and England, had useful and sometimes important results during the war. In 1917 wireless signals from Germany were intercepted at the naval wireless station at Applecross (near Perth in Western Australia), and in 1918 the writer of this article succeeded in receiving a series of test-messages from the Marconi trans-Atlantic station at Carnarvon in Wales. These experiments were completed by the receipt at Wahroonga near Sydney, on 22 September 1918, of the first direct wireless message from England to Australia. On 13 August 1919 the first public demonstration of wireless telephony was given in the Royal Society's building in Sydney; another was given on 13 October 1920 in Queen's Hall of the federal parliament-house at Melbourne. From 1905 to 1915 the administration of the wireless telegraph act was in the hands of the federal postmaster-general; in 1915 it was transferred to the minister for the navy, and in 1920 re-transferred to the postmaster-general.

Private wireless stations are now (1926) allowed under licence from the postmaster-general, but all public wireless communication in and from Australia is controlled by a company in which the federal government appoints a majority of the directors and holds a majority of the shares. The Amalgamated Wireless Ltd. must by the terms of the agreement under which it exists remain a British concern not connected with any trust or combine; it will erect and operate (*a*) main power stations for direct service with the United Kingdom, (*b*) feeder stations connecting the main stations with the federal and State capitals, (*c*) coastal stations, where required, to maintain communication with vessels off the coast, and (*d*) certain stations in Papua and the neighbouring islands. It will also arrange the provision of stations in the United Kingdom and Canada capable of maintaining direct communication with Australia. The rates will be, roughly speaking, two-thirds of those charged for cable messages. Existing Commonwealth stations are taken over.

On 24 May 1923 a conference of all parties interested in wireless broadcasting was held in Melbourne with George Taylor as chairman. A provisional scheme involving the use of sealed sets, so that listeners-in could hear only the station for which their sets were attuned, was adopted at this conference and given a trial, but proved unsatisfactory. The scheme finally adopted is designed to give full freedom in the establishment and conduct of broadcasting services, while avoiding the disabilities of American and English broadcasting. Briefly described, it includes concessions by the government to persons or firms to establish and carry on broadcasting services on a competitive basis; the licensing of private individuals to transmit for experimental purposes, and of others to use apparatus for the purpose of receiving from any services to which they care to belong; and the licensing of manufacturers and traders to deal in wireless apparatus for broadcasting purposes. E.T.F.

Raffles Bay. See NORTHERN TERRITORY and STIRLING, SIR JAMES.

Rails, a name in general use for long-toed water-birds of the family Rallidae, represented in Australia by about 15 species. The more typical forms are shy birds, frequenting swamps

and concealing themselves among the reeds. The smaller forms are known as crakes. The Black Moor-hen (*Gallinula tenebrosa*), which is more aquatic, is commonly seen swimming on ponds and dams with a constant jerking motion of the head. The largest Australian rails are the swamp-hens or bald coots (*Porphyrio*), of which one species is found throughout most of Australia and New Zealand and the second is confined to the south-west. They are handsome birds, with blue and black plumage and bright red beaks, hence often called red-bills; a horny shield on the forehead is of the same colour as

Bald Coot (*length* 17½ *in.*).

the beak. They spend most of their time among the reeds, but towards evening often walk about in open country adjacent to swamps, feeding on grass and herbage.

An interesting member of the rail family is the Native Hen (*Tribonyx mortieri*), peculiar to Tasmania. This bird is brown in colour and comparatively large in size. Its wings are very much reduced, so that it can scarcely fly; as several islands in different parts of the world (including New Zealand) possess flightless birds belonging to this family, it is evident that the Tasmanian species has almost reached the flightless condition through long disuse of its wings. The Black-tailed Native Hen (*Tribonyx ventralis*), found on the mainland, is chiefly an inland bird. At times, probably owing to droughts, it visits the coastal districts in immense numbers, great flights having been noted at different times at Adelaide, Perth, and Geraldton; the birds have been known to appear in city streets, and to do much damage to vegetables and other crops in the suburbs.

The Coot (*Fulica atra*) belongs to a subdivision of the rail family characterized by the possession of webbed toes—each toe being separately webbed, as in the grebes. Coots, as might be expected from the structure of their feet, are more aquatic than other rails, usually frequenting large sheets of fresh water and obtaining their food by diving. The coot is black, with a white shield on the forehead, and is found from Australia to Europe. **W.B.A.**

Railway Gauges. The Government railways of each State vary in gauge, so that it is impossible for rolling-stock to be interchanged, except to a certain extent between Victoria and South Australia. If we take privately-owned railways into consideration, South Australia has six different gauges, Western Australia, Victoria, and New South Wales four each, Queensland three, and Tasmania two. The Commonwealth territories (Federal and Northern) are the only divisions with one gauge each, and those gauges are not the same. The following table shows the mileages and gauges of government-owned railways only; private railways are with very few exceptions of small mileage, and their gauges are not of much importance. The standard gauge in New South Wales is 4 ft. 8½ in., and the few miles of 5 ft. 3 in. gauge in that State are extensions from the Victorian system. All other 4 ft. 8½ in. lines are federal. The standard gauge of Victoria is 5 ft. 3 in., and of Queensland, Tasmania, the Northern Territory, and Western Australia 3 ft. 6 in. South Australia adopted the 5 ft. 3 in. gauge for her lines around Adelaide and those running towards Victoria, and 3 ft. 6 in. for the rest.

Situated in.	Route Mileage of Gauge, 1925.					Total.
	5 ft. 3 in.	4 ft. 8½ in.	3 ft. 6 in.	2 ft. 6 in.	2 ft. 0 in.	
	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.
New South Wales	44·33	5,616·29	39·51	.....	.....	5,700·13
Victoria	4,317·58	.....	.....	121·77	.....	4,439·35
Queensland	.....	.....	6,084·16	.....	30·26	6,114·42
South Australia	1,261·25	597·46	1,668·45	.....	.....	3,527·16
Western Australia ...	.....	453·99	3,733·32	.....	.....	4,187·31
Tasmania	.....	.....	648·07	.....	24·83	672·90
Federal Territory	.....	4·94	.....	.....	.....	4·94
Northern Territory ...	.....	.....	198·68	.....	.....	198·68
Total	5,623·16	6,672·68	12,372·19	121·77	55·09	24,844·89

During the early days of railways the question of gauge was much debated in England. George Stephenson adopted 4 ft. 8½ in.; Brunel built the Great Western railway in 1838 on a 7 ft. gauge. A royal commission in 1846 reported in favour of a uniform gauge, and an act passed in the same year made 4 ft. 8½ in. the standard gauge for England, and 5 ft. 3 in. for Ireland. On 5 October 1847 the legislative council of South Australia adopted 4 ft. 8½ in. for all future public railways. On 30 June 1848 the colonial office suggested to the governors of New South Wales and Western Australia that a uniform gauge should be settled on 'with a view to the probability of the meeting, at some future, though probably distant, period, of the lines, not only in the same settlement, but by a junction of those constructed in the adjacent colonies;' the English commissioners of railways favoured 4 ft. 8½ in., which had already been adopted by South Australia, and it would be as well for New South Wales (which then, of course, included Victoria) and Western Australia to conform. In 1848 New South Wales railway proposals were forwarded to the home government, the 4 ft. 8½ in. gauge was approved of, and the Sydney Railway Company contemplated building to that gauge the projected railway from Sydney to Goulburn. On 21 May 1850, however, F. W. Shields, the engineer of the company, strongly advocated the adoption of the Irish gauge of 5 ft. 3 in., the English commissioners said the matter was not of sufficient importance to justify opposition,

and on 14 February 1851 the colonial office intimated that New South Wales could do as it liked. On 27 July 1852, 5 ft. 3 in. was fixed by legislative act as the gauge for the railways of that colony, and the governors of Victoria (now a separate colony) and South Australia were so advised on 23 August. In November 1850, however, Shields had resigned and returned to England, and his successor James Wallace reported on 8 September 1852 in favour of the 4 ft. 8½ in. gauge; the company in turn induced the government to repeal the act of July, and on 4 August 1853 a new act sanctioned the narrower gauge. This action, taken without the concurrence of Victoria and South Australia, was strongly protested against by the Victorian government and condemned (but not annulled) by the colonial office. The Melbourne and Hobson's Bay Railway Company and the Geelong and Melbourne Railway Company had already placed indents for rolling-stock and crossings made to a 5 ft. 3 in. gauge, and Victoria and South Australia determined to adhere to 5 ft. 3 in. In 1857 John Whitton, Wallace's successor, pointed out that difficulties would occur when the New South Wales and Victorian lines met at Albury, and endeavoured, unsuccessfully, to persuade the government of New South Wales to revert to the 5 ft. 3 in. gauge.

On 14 June 1883 the railways of New South Wales and Victoria were brought into touch by the opening of a railway bridge over the Murray at Wodonga; from that moment the inconvenience and expense of transferring passengers, goods, live stock, etc. between the colonies became apparent. On 16 January 1888 the Queensland (3 ft. 6 in.) and New South Wales (4 ft. 8½ in.) lines met at Wallangarra, and the same inconvenience was experienced. Thenceforth the question of unifying the various gauges, at least on the main lines between the colonial capitals, became one of practical politics. In 1889 E. M. G. Eddy, chief commissioner of the New South Wales railways, impressed on his premier Henry Parkes the urgency of adopting a universal gauge; forthwith conferences of premiers, railway commissioners, and engineers resolved, and continued for many years to resolve, that unification must come—there were such conferences in 1897, 1903, 1912, 1913, 1914, 1915, 1916, 1918 (two), 1920 (two), and 1921. The first of these that took practical steps towards the solution of the problem was that of July 1920 between Commonwealth and State ministers, which set up a royal commission—two experts from oversea and an Australian not connected with any Australian railways—to report on the whole question. Rustat Blake from England, Frederick Methven Whyte from the United States, and John Joseph Garvan of Sydney, were accordingly appointed on 8 February 1921, and their report was discussed at a premiers' conference in November. They recommended the adoption of the 4 ft. 8½ in. gauge, and estimated the cost of conversion of all Australian lines of other gauges (including the rolling-stock), and of the construction of certain new lines, at £57,200,000; the cost of conversion of the more important lines only—all Victorian and South Australian broad-gauge lines and the Fremantle-Kalgoorlie line in Western Australia—together with the construction of new lines from Port Augusta to Adelaide and from Kyogle in northern New South Wales to Brisbane, they estimated at £21,600,000. The premiers accepted this report in principle, deciding that the Commonwealth should bear one-fifth of the cost, the remainder being shared among the mainland States in proportion to population; but Victoria and South Australia afterwards withdrew for the time being in so far as their broad-gauge lines were concerned.

In 1924 the Commonwealth, New South Wales, and Queensland decided to begin work on the Kyogle-Brisbane line, which will give through running from Brisbane south to Albury (1014 miles) or south-west to Broken Hill (1309 miles). This part of the scheme is now (1926) in progress. The construction of a 4 ft. 8½ in. gauge line from Port Augusta in South Australia to Redhill, 126 miles north of Adelaide, and the laying of a third rail from Redhill to Adelaide, is still under discussion; this would eliminate two breaks of gauge and provide a clear run from Kalgoorlie to Adelaide (1241 miles).

J.P.M.

Railways and Tramways, *New South Wales.*—In 1845, the year of the English 'railway mania,' 1263 private bills for the construction of railways were lodged at Westminster with the clerk of parliaments, and among them was that of the Sydney, Parramatta, Richmond, and Windsor Railway Company, which contemplated the construction of a line 40 miles long at a cost of £500,000. When the news of this and other proposals reached Sydney, an agitation for the introduction of railways into the colony began, and at a public meeting held on 29 January 1846 a proposal was formulated for a locally promoted line from Sydney to Goulburn. A rough survey was made by Lieutenant Woore, R.N., whose report to a meeting on 27 January 1848 resulted in the formation of the Sydney Railway Company. This company, formed in September 1848 and incorporated by act of parliament on 10 October 1849, proposed to begin with a line from Sydney to Parramatta, and elected Charles Cowper (q.v.) president and manager; the first sod for the line was turned on 3 July 1850 by the daughter of Sir Charles FitzRoy, then governor. Pending the settlement of the gauge question (for which see RAILWAY GAUGES), a contract was let for the construction of bridges, culverts, and earthworks between Sydney and Haslem's Creek (Rookwood), and was being steadily carried out when the discovery of gold at Ophir depopulated the labour market and the contractor had to be released from his contract. The government imported 500 navvies, and work was resumed by the company itself; but the cost of labour continually increased, the company found its finances seriously embarrassed, and the government, after advancing £150,000, took the line over and completed it on 3 September 1855. Three locomotives and tenders were imported, built by Robert Stephenson and Company of Newcastle-on-Tyne. The railway was opened between Sydney and Parramatta Junction (afterwards Granville), a length of 13 miles 28 chains, on 26 September 1855; its total cost was £565,710.

On 10 October 1853 the Hunter River Railway Company was incorporated to construct a railway from Newcastle to West Maitland and beyond. It commenced construction from Newcastle to Morpeth, but was soon in financial difficulties, and on 16 May 1855 the government had to take over and complete the works. The company imported two four-wheeled tank-locomotives built by William Fairbairn and Company of Manchester. The section from Honeysuckle Point to East Maitland (17 m. 8¾ ch.) was opened on 5 April 1857, and that from Honeysuckle Point to Newcastle on 9 March 1858.

An act of 1854 made provision for the con-

struction of railways by the government and for the appointment of three commissioners to build and operate them; the first commissioner was Captain Martindale. Construction went on apace; by 1865 the mileage totalled 143, the termini in the Sydney district being Darling Harbour, Picton, Penrith, and Richmond; in the north the railway extended from Newcastle to Singleton, with a branch from East Maitland to Morpeth. By 1875 the mileage had increased to 437, and in 1885 was 1732. In 1925 the railways owned by the State reached a mileage of 5656; Victoria owns the Deniliquin to Moama railway (44½ miles); and there are 324½ miles of other railways, principally private lines for the conveyance of coal and other minerals and small lines owned by the public works department and defence department. On 30 June 1925 359 miles were under construction. Duplication of tracks and reduction of grades and curves have been effected almost continuously during the past 20 years. The Southern line is double-tracked to Cootamundra (267 miles), the Western to Orange (199), the Northern to Branxton (134), and the South Coast to Wollongong (51); the suburban lines round Sydney are quadrupled to Parramatta (14½), Hurstville (9), and Belmore (8), as is the line from Newcastle to West Maitland (15).

Connection was made with the Victorian system at Albury on 14 June 1883, and with the Queensland railways at Wallangarra on 16 January 1888. A line from Menindee on the Darling to Broken Hill (73 miles) is met there by the line (3 ft. 6 in. gauge) of the Silverton Tramway Company, which connects with the South Australian government narrow-gauge line at Cockburn.

The New South Wales railways have some fine engineering performances to their credit. Hawkesbury River bridge is described under VIADUCTS AND BRIDGES. Another famous work was the Lithgow Zigzag, by means of which the descent of the Blue Mountains into the Lithgow valley was accomplished. This zigzag was abandoned in October 1910, traffic being diverted to a longer line of much easier grade. The ascent of the Blue Mountains from the east (which was at first accomplished by a minor zigzag) is now made by a long easy deviation which has reduced the grade from 1 in 30 to 1 in 80, and similar well-planned deviations have replaced the original steep ascent at Picton on the Southern line and Stanwell Park on the South Coast line. A work of a different but still more important character is the city (Sydney) railway, a section of which will be opened in January, 1927. The underground portion of this railway was excavated largely on the cut-and-cover principle through solid sandstone. The suburban railways of Sydney are now in process of conversion from steam to electric power, and the city railway will be an electric line, connected with the Sydney harbour bridge (q.v.). In the New South Wales railway-system £100,000,000 has been invested; its earnings are nearly £17,000,000 per annum, and it employs over 40,000 people.

Victoria.—On 21 June 1852 a deputation waited upon Governor Latrobe concerning a line from Melbourne to Mount Alexander. The promoters asked for a loan, a grant for survey expenses, a free grant of land six chains wide along the entire length of the proposed line of about 100 miles, a square mile of land in every 10 miles along the route, and a guaranteed dividend upon subscribed capital. The governor at first demurred, but the promoters in the end received land-grants and financial assistance in a modified form. On 8 February 1853 the Melbourne, Mount Alexander and Murray River Company's act was assented to. A sum of £5000, granted by the government for preliminary expenses, formed for a considerable time its only capital; the first sod was turned on 12 June 1854, but owing to financial difficulties little progress was made, and on 3 May 1856 the government had to take over the works.

The Melbourne and Hobson's Bay Railway Company was formed in 1852, and by an act of 1853 it was empowered to construct a line from Melbourne (Flinders-street) to Sandridge (now Port Melbourne); the gauge was fixed at 5 ft. 3 in., and the company was given a strip of land 100 yards wide along the whole length of the line, and also station-sites of over 24 acres at Melbourne, and over 9 acres at Sandridge. The line, which was opened on 13 September 1854, was the first steam railway in Australia opened for the conveyance of traffic. Carriages and waggons from England had been delivered, but four locomotives were delayed, and the directors placed an order with Robertson, Martin, Smith and Company of Melbourne, and entrusted the making of parts of the boiler to the Langlands Foundry. This locomotive (of 30-horse-power) was completed in ten weeks, and was the first one built in Australia. On the opening run the train did 15 miles per hour, but bad fuel on the 16th and damage to the locomotive on the 18th hampered the running, and for a while trains were not run. While the locomotive was undergoing repairs, a pile-driving engine fitted to a truck, which had been used for drawing waggons during construction, was brought into use, and ran the passenger trains as fast as the larger engine had done. On 2 December, however, the company was compelled to advertise: 'The Locomotive having broken down, and those from England not yet landed, the train will cease running until further notice.' The locomotives from England arrived early in 1855, and the company's troubles were overcome.

The second locomotive built in Victoria was made by Enoch Chambers out of duplicate wheels and cylinders imported by the Melbourne and Suburban Railway Company. This engine was built for a firm of contractors, and did duty for many years.

In January 1853 the Geelong and Melbourne Railway Company was formed with a capital of £350,000, and an act was passed in February authorizing the company to construct a railway from Melbourne to Geelong. The government granted a strip of land 100 yards wide for the entire length of the line, recesses for stations, and 11½ acres for a terminus at Geelong, advanced £1000 towards preliminary expenses, and guaranteed a dividend of 5 per cent per annum on the 17,500 shares; but construction proceeded very slowly, the first section (Geelong to Duck Ponds) was not opened until 17 October 1856, and the whole line from Williamstown Junction to Geelong (38½ miles) was not opened until 25 June 1857. The government took over the lines in 1860.

The Melbourne and Hobson's Bay Railway Company also constructed a branch line from the Port Melbourne railway to St. Kilda (opened on 15 May 1857) and the St. Kilda and Brighton Railway Company, a line from St. Kilda station across Albert Park and St. Kilda-road to Chapel-street, Windsor, and thence to Brighton (opened

on 19 December 1859). The section from St. Kilda to Windsor was subsequently pulled up.

The Melbourne and Suburban Railway Company, incorporated on 24 November 1857, built the lines from Prince's Bridge at Melbourne, to Chapel-street in Prahran, and from Swan-street station in Richmond to Hawthorn. Free grants of land were made by the government. The line to Punt-road was opened on 8 February 1858, to Cremorne Gardens on 12 December 1859, and to Chapel-street on 22 December 1860; the Hawthorn branch was opened on 1 October 1860.

In June 1866 the Melbourne and Hobson's Bay and the Melbourne and Suburban companies were amalgamated, and subsequently these, together with the Brighton Railway Company, became the Melbourne and Hobson's Bay United Railway Company, and connection was made between Flinders-street station and Prince's Bridge station. On 1 July 1878 the government purchased this company's whole suburban system—9¾ miles of double track and 6¾ miles of single track—for £1,320,000.

Outside the suburbs private enterprise could not surmount the financial difficulties, and the government had to take railway construction in hand. Acts in 1856 provided for the construction of 185 miles of railway, including lines from Melbourne to Castlemaine, Geelong to Ballarat and westward, and a branch to Williamstown. An act of 1857 authorized the construction of main trunk-lines, including that to the Murray. By 1865 the mileage open totalled 273½, the termini being Melbourne, Port Melbourne, St. Kilda, Brighton Beach, Hawthorn, Geelong, Ballarat, and Echuca. In 1875 the mileage was 615, and in 1885 1672. In 1925, 71 years after the opening of the first railway, there were 4491 miles in use, and 180¼ under construction. The 61½ miles of privately-owned railways are principally used for traffic in timber, firewood, and sand.

The Melbourne suburban railways handle an enormous amount of passenger business (156,678,519 journeys in 1925), and a system of electric railways has been introduced, comprising 157.3 route-miles. 'Tait' cars with sliding doors and seating accommodation for 92 persons are used in this service; normal trains have six cars, but in the 'off' hours of the day four-car, two-car, and even one-car trains are run. Two electric locomotives are used for shunting, and for hauling goods-trains; the question of hauling all suburban goods-trains by electric power is under consideration.

Queensland.—Railways in Queensland were from the beginning constructed by the government. Since the colony at first contained little more than 25,000 white inhabitants, economy in construction had to be considered, and a 3 ft. 6 in. gauge was therefore adopted. An act of 1863 provided for the construction and regulation of railways; a contract was let to the English firm of Peto, Brassey, and Betts for the construction of a railway from Ipswich to the Little Liverpool Range (21½ miles); and on 31 July 1865 the railway from Ipswich to Bigge's Camp (now Grandchester) was officially opened. The next (31 miles from Rockhampton to Westwood) was opened on 17 September 1867. A line from Grandchester to Toowoomba was opened on 1 May 1867, but Brisbane was not connected with any line until 14 June 1875, when a section of 4½ miles (Oxley Point to Roma-street) was opened. A steel bridge of eight spans over the Brisbane River at Indooroopilly was opened in July 1876, but was destroyed by a flood in 1893 and replaced in 1895 by a higher bridge of two spans of 330 ft. each. Despite the small population, Queensland had by 1875 265¾ miles of line; in 1885 the mileage had reached 1433. Connection was made with the New South Wales railways at Wallangarra on 16 January 1888. In 1925, after 60 years of operation, 6114½ miles of government-owned railway—the greatest mileage of any State system—were open, as well as 1302 miles of private railway, most of it used for the haulage of sugar-cane and coal. A route-mile of government railway is open for every 140 of the population. The policy of the government for some years has been to provide railways in advance of ordinary population, and rates and fares are kept comparatively low; decentralization has also been considered. This policy has been a great factor in the development of Queensland, especially of its seaports, but probably has an important bearing on the losses which the State railways are experiencing—in the last eight years, after providing for interest, the loss has been £11,118,999. The seaports as far north as Cairns are now all connected by railway, the last section from Lilypond to Cardwell having been opened on 10 December 1924. There are 376 miles under construction. The capital cost is £51,911,969; in 1925 29,657,832 passengers were carried and 5,083,658 tons of goods and live stock.

The first locomotive made in Queensland was the six-ton 'Mary Ann,' built by John Walker and Co. (now Walkers Limited) of Maryborough for Pettigrew and Sim for use on a wooden railway from Thannae to Tin Can Bay. The first locomotive made in Queensland for use on the railways was built by the Phoenix Engineering Company at Ipswich in 1889.

Two considerable feats of engineering involved in the building of the State lines are (*a*) the ascent of the dividing range between Brisbane and Toowoomba, a climb of 1250 feet in 17 miles, achieved in 1866, and (*b*) the line which connects Cairns with the tableland immediately behind it by a climb of 3022 feet.

South Australia.—The construction of railways in South Australia was first proposed in 1846, and a public railways act was passed in March 1847. This, the first measure passed in Australia in connection with railways, incorporated many obsolete provisions of English railway legislation; each engine must consume its own smoke under a penalty of £5 per day, private persons were allowed to use their own waggons, etc. In 1848 the Adelaide City and Port Railway Company was formed in London; an act of 1850 authorized the construction of a railway on a gauge of 4 ft. 8½ in. from the city to the port of Adelaide, with a branch to the north arm of the river, 5 per cent on the estimated cost of construction being guaranteed by the colony for ten years. The company, however, regarded its project rather as a land speculation than as a railway, and, as the government would grant only sufficient land for the construction of the line, allowed the matter to drop. The government then undertook the work, altered the gauge to 5 ft. 3 in. (see RAILWAY GAUGES), an act of 1851 authorized the construction out of public funds, and £50,000 was voted for the line—which was the first government railway on British soil. The gold discoveries in Victoria and New South Wales seriously affected the labour market—labourers had to be paid 20s. per day, and a driver with cart and horse £12 per week—and the cost of the line, 7½ miles in

length, rose to £204,000. It was opened for traffic on 21 April 1856.

On 14 May 1854 a horse tramway 6 miles 16 ch. long from Goolwa to Port Elliot, built by the central road-board, was opened by the Government; this was really the first line opened in Australia, but was more of a tramway than a railway, the rails being of iron and weighing only 30 lb. per yard.

The first locomotives, built by Fairbairn and Company of Manchester, arrived at the Semaphore late in October 1855, and the first trial trip was made on 31 January 1856. In 1854 the government began to construct a trunk line to the north, and the first section (Adelaide to Gawler, 24 m. 61 ch.) was opened on 5 October 1857. This line and the Adelaide City and Port Railway were built with bridge-rails laid upon longitudinal jarrah timbers 12 by 6 in. which were connected transversely by transoms notched into and bolted to them. As the route-mileage of the system gradually increased, the less important lines were built on a 3 ft. 6 in. gauge, the 5 ft. 3 in. gauge being retained for trunk-lines. Among the narrow-gauge lines the most notable was that from Port Augusta to Oodnadatta in central Australia, which was constructed in sections between 1878 and 1891; it is 478 miles long, and was originally intended to form part of a transcontinental line to the Northern Territory (q.v.). The capital cost of such a line, however, was—considering the many years that must elapse before the running was likely to show a profit—much too great for a comparatively empty colony to contemplate, and the extension beyond Oodnadatta in pursuance of the original purpose is only now (1926) being taken in hand by the Commonwealth. At the northern end of the proposed transcontinental line an act of 1883 authorized the construction of a railway of 3 ft. 6 in. gauge from Palmerston (now Darwin) to Pine Creek; £959,300 was raised for it (besides £57,000 for a jetty at Palmerston), and alternative tenders were called for construction by European and Chinese labour. As Chinese labour was much cheaper, a tender on that basis was accepted, arrangements were made by the contractors with the Chinese government for the supply of labour, and at one time 3000 Chinese were employed. The line was opened to the Adelaide River (77 miles) in June 1888, and completed to Pine Creek on 1 October 1889.

In 1865 the route-mileage of the South Australian railways was 68; by 1875 it was 209, and in 1885 1203 miles were open. The main eastern line from Adelaide was connected with the western Victorian line at Serviceton on 19 January 1887—as the gauge was the same, trains have since run through between Melbourne and Adelaide. In 1911 the South Australian mileage was reduced by 623½ miles, the Oodnadatta and Pine Creek lines having been transferred to the Commonwealth. In 1925 the mileage of State-owned railways was 2451¾; there were also 50 miles of private line, used chiefly for the conveyance of minerals. On 30 June 1925 114 miles of new line were under construction.

Western Australia.—The first railway opened for traffic in this State was the 12-mile line from Lockeville to Yoganup, which was constructed for the Western Australian Timber Company in 1871; the first locomotive used on this line was recently presented by the Busselton municipal council to the State. The construction of other railways was initiated by the government in 1873, when the line from Geraldton to Northampton (33¼ miles) was authorized; owing to the small population, the 3 ft. 6 in. gauge was adopted for purposes of economy. Construction was begun in 1874, but the line was not opened for traffic until 26 July 1879, though a section of 18 miles was unofficially opened on 25 September 1877. The line from Fremantle to Guildford (20 miles) was opened on 1 March 1881. By 1885 there were only 124 miles of railway. The discovery of gold in 1886 and subsequent years, however, gave a great impetus to railway construction, and lines were laid in all directions. The mileage of government lines increased from 203 in 1893 to 1434 in 1903. The 242-mile line from Albany to Beverley, which was constructed in 1889 on the land-grant system by the West Australian Land Company, was purchased by the government in 1896 for £1,100,000, the company handing over the whole of its properties and also relinquishing its right to about 2,700,000 acres of land. Another long railway (278½ miles) from Midland Junction to Walkaway (where it junctions with the government railway from Geraldton) was constructed on the land-grant principle by the Midland Railway Company of Western Australia, which has headquarters in London. The government granted the company 12,000 acres of land per mile of line constructed, to be selected anywhere along the route of the railway within a belt extending 40 miles on each side of the line; the total area thus acquired was 3,316,464 acres. The government also helped the company through financial difficulties which at one time caused the suspension of construction. The line was completed and opened for traffic on 24 November 1894. Several negotiations for the purchase of the line by the government have come to nothing.

In 1925 the mileage of government-owned railways amounted to 3733; there were also 826 miles of privately-owned lines, most of which (outside the Midland Railway Company's line) were used for the conveyance of timber and firewood. On 30 June 138½ miles of new railways were under construction.

In Western Australia there is a mile of railway-line for every 81 of its population.

Tasmania.—In 1856 Adye Douglas advocated without success the building of a line from Hobart to Launceston; in 1864 a railway from Launceston to Deloraine was proposed, and an act of 1867 authorized this line, which was known as the Launceston and Western Railway. The line was built to the 5 ft. 3 in. gauge and opened for traffic on 10 February 1871. The company, however, soon found itself in financial difficulties, and in 1872 the railway was taken over by the government. An act of 1869 empowered the Tasmanian Main Line Railway Company to build a line, 122 miles in length, from Hobart to Evandale near Launceston, where it would meet the Deloraine line; the 3 ft. 6 in. gauge was adopted owing to the mountainous nature of the country, and a third rail was laid on the 5 ft. 3 in. line between Evandale and Launceston. When the 3 ft. 6 in. gauge became the standard for Tasmania, the Launceston and Western railway was converted. The line from Hobart to Launceston was commenced in 1872, and opened for traffic on 1 November 1876; it cost £1,190,000, and was sold to the government in 1890 for £1,106,500. The extension of the railway-system in Tasmania was a very slow process, because of the small area of the island, the many good harbours and good

roads, and the meagre population. In 1892 the mileage was 419¾; in 1905 it was 462½; in 1925 there were 673 miles of government-owned railway. The mileage of private railways (235½) is large in comparison; the Emu Bay Railway Company and the Mount Lyell Mining and Railway Company handle general traffic, and other private lines handle minerals and timber as well.

Commonwealth.—On 1 January 1911 the Commonwealth government purchased at cost price from South Australia the railway from Port Augusta to Oodnadatta, and that from Darwin to Pine Creek. An extension of the latter for 53 miles to Emungalan on the Katherine River was constructed by the Commonwealth and opened on 13 May 1917. This section was built to the 3 ft. 6 in. gauge, but the dimensions of all structures, sleepers, etc. were calculated for ultimate conversion to the 4 ft. 8½ in. gauge. A further extension from Emungalan to Daly Waters (about 160 miles), authorized on 11 August 1923, involved the erection of a large bridge over the Katherine River, which was completed in January 1926. Tenders are being invited for the construction of the extension.

The longest railway constructed in Australia at one time is the Trans-Australian railway of 4 ft. 8½ in. gauge from Kalgoorlie in Western Australia to Port Augusta in South Australia, a distance of 1051½ miles. This railway was promised to Western Australia as an inducement to join the Commonwealth. A survey authorized in 1907 was completed in March 1909; in December 1911 an act authorized the construction of the line, provided that South Australia and Western Australia granted the necessary land. On 14 September 1912 the first sod was turned by Lord Denman at Port Augusta, and the line was opened for traffic on 22 October 1917. In one day 2 m. 40 ch. of line was laid; in one week 14 m. 50 ch.; in four weeks 46 m. 62 ch., and in one year 442 m. 44 ch. There were no great engineering difficulties to surmount, for throughout the whole length of line there was not a single stream of water, and across the Nullarbor plain water had to be conveyed for nearly 500 miles, owing to the poor quality of the water obtained by boring. Further, rails and other material for more than two miles' work per day had to be delivered to the rail-head, and food-supplies had to be assured. This work the Commonwealth railway department was forced to undertake on the eastern side; stores, bakeries, meat-supply—and at one time boarding-houses, the largest accommodating 500 men—had to be provided. The line runs through 800 miles of country inhabited only by a handful of nomadic blacks, and across the Nullarbor plain it is straight for 330 miles. On this railway were used the first rails made in Australia (by G. and C. Hoskins of Eskbank in New South Wales), as well as the first rails made by the Broken Hill Proprietary Limited at Newcastle (see IRON).

The only line in the Federal Territory runs from Queanbeyan to Canberra (4 m. 75 ch.); it is built on the 4 ft. 8½ in. gauge, and was opened on 25 May 1914.

The longest railway journey now possible in Australia is from Meekatharra in Western Australia to Dajarra in Queensland, the distance being 5500 miles. Unfortunately it involves five breaks of gauge. The following table gives financial and statistical information concerning the government railways of the Commonwealth and the States for the year ended 30 June 1925.

Item.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Commonwealth.	Australia.
Financial.	£	£	£	£	£	£	£	£
Capital cost ...	99,623,216	67,739,091	51,911,969	24,046,664	20,318,120	6,416,194	11,833,189	281,888,443
Gross earnings ...	16,769,452	12,759,197	7,109,210	4,012,736	3,359,501	548,256	409,112	44,967,464
Working expenses ..	11,939,686	9,429,728	5,425,167	2,935,755	2,347,509	518,990	497,070	33,093,905
Interest	4,796,829	3,085,648	2,578,541	1,018,117	813,849	279,832	272,611	12,845,427
Profit or loss after interest	P. 32,937	P. 243,821	L. 894,498	P. 58,864	P. 198,143	L.250,566	L. 360,569	L. 971,868
Return on capital (per cent.) ...	Per cent. 5·01	Per cent. 4·94	Per cent. —3·24	Per cent. 4·90	Per cent. 4·94	Per cent. —0·46	Per cent. —0·74	Per cent. —4·21
Statistical.	No.	No.	No.	No.	No.	No.	No.	No.
Route-miles open....	5,656	4,484	6,114	2,452	3,733	673	1,733	24,845
Passengers carried	128,532,033	166,441,142	29,657,832	25,647,487	17,196,672	2,656,018	211,981	370,343,170
Tonnage of goods and live stock ...	16,208,476	8,959,556	5,083,653	3,611,313	3,284,915	718,198	146,511	38,012,627
Train-miles run ...	23,304,916	17,482,006	12,107,995	6,653,248	4,841,473	1,385,892	813,499	66,589,029
Locomotives ...	1,403	728*	714	479	404	96	69	3,893
Carriages	2,220	2,727†	1,100	741	482	238	49	7,557
Waggons	22,141	19,250	15,188	9,767	9,745	1,797	249	78,137
Service vehicles ...	1,617	752	1,450	552	475	61	486	5,393
Employees... ...	40,013	29,152	18,372	11,071	7,616	1,596	902	108,722

* Includes two electric locomotives. † Includes cars with electric motors.

TRAMWAYS.—The tramways of Australia are confined almost exclusively to the streets and roads of cities and large towns. Electric traction is the system generally in use, and any cable trams still in existence in Melbourne are in process of conversion to electric. Steam trams run in a few places in New South Wales. Almost all the tramways are now owned either by the State government or by municipalities.

The following tables show the tramway mileages in the States, their motive power and their controlling authority:—

Mileage according to motive power.

Motive Power.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Australia.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Electric ...	169·50	107·47	47·13	73·83	57·67	26·64	482·24
Steam ...	61·57	...	6·65	...	17·75	...	85·97
Cable ...	...	45·58	...	...	...	...	45·58
Horse ...	...	...	...	...	7·39	...	7·39
Total ...	231·07	153·05	53·78	73·83	82·81	26·64	621·18

Mileage according to controlling authority.

Controlling Authority.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Australia.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent
Government	227·57	125·36	47·13	73·83	59·38	...	533·27
Municipal	...	...	6·65	...	8·61	26·64	41·90
Private ...	3·50	27·69	...	...	14·82	...	46·01
Total ...	231·07	153·05	53·78	73·83	82·81	26·64	621·18

New South Wales.—As soon as the railway from Parramatta Junction to Sydney was opened, an agitation to lay a tramway from the Sydney terminus into the city was started. This tramway, 1¾ miles in length, was opened with horse traction in October 1862, but was strenuously objected to because the lines stood above the surface of the road, and an act passed in November 1865 ordered their removal. Sydney remained without a tramway until 15 September 1879, when a line from Hunter-street to Hay-street via Elizabeth-street was opened to convey passengers to and from the international exhibition in the domain. Horse, and afterwards steam, traction was used, with double-decked cars. The extension from Hunter-street to Bridge-street was not opened until 15 September 1882. Meanwhile lines had been laid to High-street, Randwick (19 March 1881), Waverley (13 April 1881), Cleveland-street (15 September 1881), Botany (17 May 1882), Forest Lodge (15 August 1882), and Glebe Point (15 August 1882). In 1885 there were 27½ miles of tramways, all in and round Sydney; in 1895 the mileage in New South Wales had increased to 40¼, in 1905 to 107¼, and in 1925 to 228½—all owned by the government. The first cable tramway in Sydney was from Milson's Point to Ridge-street on the North Shore. The King-street to Ocean-street cable tramway was opened on 19 September 1894. The first electric tramway, along Military-road, North Sydney, was opened on 20 September 1893; the next, from Ocean-street to Rose Bay, on 4 October 1898. The electric line from John-street, Pyrmont, to Circular Quay via George-street was opened on 8 September 1899.

There are now no cable trams in or round Sydney, and the only steam trams are on suburban lines serving Parramatta on the west and Bexley, Sans Souci, and Cronulla in the south. The steam tramway running from Parramatta to the ferry terminus on Duck River (3½ miles), opened in 1883, is privately owned. The other three connect outlying suburbs or watering-places with the Illawarra railway-system. A tramway from Rockdale to Brighton-le-Sands (1¼ miles) was originally a privately-owned steam-line opened in 1885; it was converted to electric traction and became the property of the government on 7 June 1914.

The first tramway in Newcastle, a steam-line eight miles long from Perkins-street to Plattsburg, was opened on 31 December 1887. In 1926 there were 35¼ miles of steam and electric lines in and round Newcastle, four miles of steam-lines from East Maitland to West Maitland (opened in 1909), and ten miles of steam-lines at Broken Hill in the far west (opened between 15 February 1902 and 23 December 1912).

All government tramways are on the 4 ft. 8½ in. gauge, and are controlled by the railway commissioners. In the year ended 30 June 1925 the passengers carried numbered 339,576,776; the capital cost of lines and equipment to that date was £11,131,454; the earnings amounted to £3,619,272, the working expenses to £3,174,862, and interest cost £546,489. The staff of employees numbered 10,708. There were 1510 electric motor vehicles, 26 steam motors, 64 steam cars, and 115 service and other vehicles in use at 30 June 1925. Electric power is obtained from the generating plants at Ultimo and White Bay in Sydney, and at Zara-street, Newcastle.

The Sydney system is by far the largest in Australia, probably in the world, having expanded because of the lack of a city railway. The competition of motor-buses and the use of motor-cars is severely felt; in the city and suburban lines of Sydney alone passenger journeys in 1925 decreased by 4,512,000 as against 1924, though the mileage run by the trams was 756,000 more.

Short lines such as those from Yass Junction to Yass, Fassifern to Toronto, and East Maitland to Morpeth, though really tramways, are part of the railway-system, and have been so included.

Victoria.—The Melbourne Omnibus Company, which had been engaged in omnibus services since 1869, in 1878 proposed to introduce a tramway-system in the city and suburbs of Melbourne and changed its name to the Melbourne Tramway and Omnibus Company. It was not, however, until 1883 that the company's act was passed; this empowered it to construct cable tramways in the streets of Melbourne and suburbs, with the consent of the municipalities interested—who, however, had the option of constructing the lines themselves. The municipalities decided to exercise the option; a tramway trust (consisting of seven members from the Melbourne city council and one each from 11 of the surrounding municipalities) was formed, and raised a loan of £1,650,000 to pay for the construction of the lines and power-houses. An amending act of 1892 required that the tramways should be completed by the end of 1893, and leased for 32 years to the company. This lease ran from 1 July 1884—when liability for interest on the loans began—to 30 June 1916. The company had to build the rolling-stock, equip the lines and power-houses, pay licence-fees for cars, drivers, and conductors, and municipal rates; it also paid the annual interest on the loan, and provided a sinking-fund for its redemption at the expiration of the lease—when, moreover, the lines and outfit must be handed over to the trust in good working order. The first line, that to Richmond, was opened on 11 November 1885; other lines were opened at short intervals, and the whole system (43½ miles of double-track cable-lines and 4½ miles of double-track horse-tramway) was completed in 1891. The horse-tramways were afterwards gradually converted to cable.

In the 1900s municipalities round Melbourne went into the tramway business somewhat extensively. The Prahran-Malvern tramway trust, appointed by the municipal councils of Prahran, Malvern, St. Kilda, Hawthorn, Kew, Camberwell, and Caulfield, built and operated electric tramways 35.11 miles in length, the first section of which was opened on 31 May 1910; the Hawthorn tramway trust opened the first section of its electric-line from Prince's Bridge to Power-street, Hawthorn, on 6 April 1916, and

eventually had 11.12 miles open; the first section of the Melbourne, Brunswick, and Coburg tramways (7.07 miles) from Moreland-road to Bell-street, was opened on 27 April 1916. A cable tramway between Clifton Hill and Preston (2¼ miles), built by a private company, was subsequently bought by the Northcote city council. The Fitzroy, Northcote, and Preston tramway (5.82 miles) was opened on 1 April 1920, and the Footscray tramway (4.73 miles) on 6 September 1921. The North Melbourne tramways (11.75 miles), from Flemington Bridge to the Saltwater River and Keilor-road, were also constructed by a private company, and were opened towards the end of 1906.

On 30 December 1915 the Victorian government appointed a 'Melbourne and metropolitan tramway board' of five members to take over the tramways as from 1 July 1916. On 1 November 1919 they took over the cable-lines, and on 2 February 1920 the electric-lines of the Prahran-Malvern, Hawthorn, Fitzroy-Northcote-Preston, and Footscray trusts, and the cable tramway of the Northcote city council. On 1 August 1922 the North Melbourne-Essendon tramways were acquired. Since assuming control the board has developed its lines considerably, and now owns 66.33 miles of double-track and 16.17 miles of single-track electric tramways, and 45.57 miles of double-track cable-lines, as well as rights over several miles of motor-bus routes. The cable trams are in process of conversion, the St. Kilda-road and Swanston-street tramway and its branches being the first section converted; a fleet of 44 motor-buses, provided by the board, handled the traffic during the conversion period. The board has found it necessary to inaugurate motor-bus routes in order to cope with private competitors, and has built large workshops at Preston. The gauge of all its lines is 4 ft. 8½ in. The employees number 5845, and the cars, dummies, and buses, 1537. Power is purchased from the State electricity commissioners, the Melbourne city council, and the Melbourne Electric Supply Company.

Under an act of 1904 the board of land and works was authorized to construct a tramway from St. Kilda to Brighton. The line to Park-street, Middle Brighton, was opened on 7 May 1906, and the extension to Brighton Beach on 22 December. The mileage is 5.16 and the gauge 5 ft. 3 in.; it is worked by the railway commissioners, as is also the electric line from Sandringham to Black Rock (2.41 miles), now being extended to Beaumaris, which was opened on 11 March 1919, the gauge being 4 ft. 8½ in.

The Ballarat and Bendigo electric tramways, which are privately owned, run along the main streets and to and from the outlying suburbs of those cities. The total length of lines open in 1925 was 21.25 miles; the gauge is 4 ft. 8½ in. The privately-owned Geelong electric tramways were opened on 14 March 1912. The length is 4.9 miles, and the gauge 4 ft. 8½ in.

Queensland.—The first tramways in Brisbane were horse-drawn, and were opened on 12 August 1885; they failed to return a profit, and the tractive power was changed from horse to electricity in 1896-7. The first line converted was from North Quay to Breakfast Creek. The electric tramways (42.6 miles) in the city and suburbs of Brisbane were constructed and controlled by a private company with its head office in London. They remained the property of the company until 31 December 1922, when they were purchased by the Queensland government, which under an act of that year appointed a trust to control and operate the system. The trust comprises two government appointees, two from the city of Brisbane, and four from suburban municipalities. The total length of the Brisbane tramways in 1925 was 47.13 route-miles, and the gauge 4 ft. 8½ in.; 79,000,000 passengers were carried.

The Rockhampton municipal tramways were opened in 1909, the motive power being steam. The length of line is 6.65 route-miles, and the gauge 3 ft. 6 in. In Queensland many tramways have been laid down, principally for the haulage of cane; as these are not tramways in the ordinary sense, they have been included under RAILWAYS (see above).

South Australia.—A system of horse tramways for Adelaide and suburbs was established by private companies in June 1878, and continued until 22 December 1906, when a municipal tramways trust act authorized the government to acquire the lines. In 1907 a trust of eight members was created—two government nominees, two elected by the city corporation, two by suburban municipalities, and two by the district councils concerned. Forty-nine miles of tramways were purchased for £283,357, and converted to an electric system; the first electric section (Kensington and Norwood) was opened on 9 March 1909. The power-house is at Port Adelaide. There are now 74 miles of tramway, on a 4 ft. 8½ in. gauge; 231 cars are in use, and there are 1583 employees. In the country districts of South Australia there are 19.86 miles of government-owned horse tramways worked in connection with the railways.

Western Australia.—The Perth electric tramways, constructed by an English private company, were opened on 24 September 1899, and subsequently extended to several suburbs. The concession under which they were constructed gave the city council options of purchase, exercisable in 1925 or 1932, and provided that, if the options had not been exercised, the undertaking should be handed over free of cost in 1939. In 1912, however, negotiations for the purchase of the lines were initiated, a tramways purchase act was passed on 27 September, and the whole system (22½ route-miles) was taken over by the government on 1 July 1913. The lines have since then been operated by the commissioner of railways. The Nedlands Park tramway and the Victoria Park municipal tramways were acquired by the government in 1913, and the Osborne Park tramway on 15 December 1914. The total route-mileage in 1925 was 34 m. 22¾ ch.; there are 113 cars and 566 employees; power is derived from the government power-house.

The Kalgoorlie and Boulder City tramways are run by a private company, the first line being opened in 1902, and the last section of the Boulder system completed in 1904. In 1925 there were 14.82 route-miles open.

The Fremantle electric tramways (8.61 route-miles), opened in November 1905, are owned and operated by the municipality. Power is obtained from the government scheme.

The gauge of all tramways in Western Australia is 3 ft. 6 in.

Tasmania.—Nine miles of electric tramway in Hobart, constructed by a private company, were opened in 1893; they are now the property of the Hobart municipal council. The route-mileage in 1925 was 16.5. Some cars are double-decked. The gauge is 3 ft. 6 in.

Under the Launceston tramway act of 1906 the Launceston city council agreed with a private

company for the construction of a system of electric tramways, but the agreement lapsed, and the council constructed and operates the tramways. The system, when opened on 16 August 1911, was 5¾ miles long; in 1925 it was 10.14 miles long. The gauge is 3 ft. 6 in.

J.P.M.

Rain-bird. See CUCKOOS.

Rainbow-bird. See KINGFISHERS AND BEE-EATERS.

Rainbow-fish. See PARROT-FISHES and WRASSES.

Ramsay, EDWARD PIERSON (1842-1917), born at Sydney on 3 December 1842 and educated at St. Mark's Collegiate School (under G. F. Macarthur, q.v.) and the university of Sydney. In 1874 he was appointed curator of the Australian Museum, helped to found the Linnean Society of New South Wales, and was a member of its council till 1892. At the end of 1894 he resigned the curatorship of the museum, but was its consulting ornithologist from 1895 to 1909. He died at Sydney on 16 December 1917.

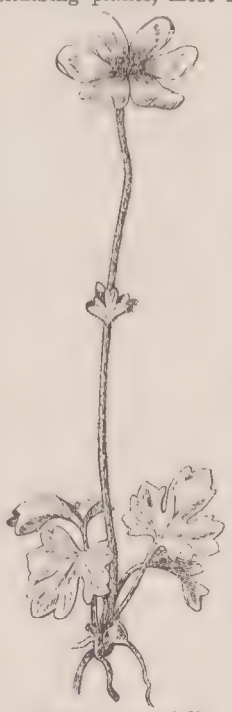
Ramsay was mainly interested in birds, of which 17,600 specimens were added to the Australian Museum during his term of office. He described many new species (principally in the *Proceedings* of the Zoological Society of London, 1865-84), including *Atrichia rufescens*, *Gliciphila subfaciata*, and *Orthonyx spaldingi*, and the egg of *Chlamydodera maculata*. He also described and named several new reptiles and many new species of mammals, among them a rat-kangaroo (*Hypsiprymnodon moschatus*) from Rockingham Bay in Queensland, and a distinct variety of echidna (*Tachyglossus aculeatus* var. *lawesi*) from Port Moresby in New Guinea. He further enriched the museum with many specimens of fishes and a valuable ichthyological library; the fishes included the collection formed by Dr. Francis Day, author of *The Fishes of India*. In 1866 he was elected a corresponding member of the Zoological Society of London, in 1875 a fellow of the Linnean Society of London, and in 1884 a member of the Royal Irish Academy. He was also a fellow of the Royal Society of Edinburgh and the Geological Society of London, and an honorary LL.D. of St. Andrews. Between 1876 and 1894 he published in four parts a *Catalogue of the Australian Birds in the Australian Museum at Sydney, New South Wales.*

Ramsay, HUGH (1877-1906), born at sea on a vessel bound for Australia, studied at the Melbourne gallery under Bernard Hall, and in 1900 went to Paris. In 1902 he had four works hung at the New Salon, where they attracted much attention and were reproduced in the official catalogue. Comyns Carr invited him to send pictures to a special exhibition at the Grafton galleries, and Dame Nellie Melba commissioned him to paint her portrait. Just when success was assured, the state of his health forced him to return to Australia. During the four years before his death he worked with a feverish activity and painted 20 full-length portraits, including 'The Sisters' (in the Sydney gallery), a self-portrait in the Melbourne gallery, and a portrait of David Mitchell—father of Melba—in the Castlemaine gallery. For the work of a young man, these portraits are remarkably mature. He died at Essendon near Melbourne in 1906. See ART.

W.M.

Randell, WILLIAM RICHARD (1824-1911), born at Sidbury in Devonshire on 2 May 1824, was in 1837 brought to South Australia by his father, W. B. Randell, a sub-manager of the South Australian Company. For some years he was employed on a station and in a flour-mill at Gumeracha, and in 1852 became interested in the problem of steam navigation on the Murray. He built the *Mary Ann* (55ft. long, 9ft. beam, 7-horse-power), the first steamer on the river, and in August 1853 set out in her a few days in advance of the official expedition under F. Cadell (q.v.) in the *Lady Augusta*; he reached Echuca, several hundred miles farther on than the point reached by Cadell, but the *Mary Ann* was too small to comply with the conditions attached to a £2000 bonus offered by the legislative council of South Australia; he was, however, granted £300 by the government and received a purse of sovereigns from citizens of South Australia. In 1855 he built a more powerful steamer, the *Gemini*, in which he proceeded up the Murrumbidgee as far as Hay, and in 1859 followed Cadell up the Darling to Murchison and reached a point on the Barwon about 120 miles above Bourke. He built up a remunerative steamship service on the inland rivers, retired from its control in 1892, and in 1893 was returned to the house of assembly for Gumeracha, retaining his seat until 1899. He died on 4 March 1911.

Ranunculaceae, a family of herbs or climbing plants, most numerous in the northern temperate regions; 5 genera with 17 species are indigenous to Australia. Of the large genus *Anemone* the only Australian species, *A. crassifolia*, is endemic, and limited to high elevations in the Tasmanian mountains. It is a perennial herb, with tufted, incised leaves and white flowers; the coloured sepals (6-7) represent obsolete petals. *Myosurus* (mouse-tail) contains 2 species; the indigenous *M. minimus* is widespread in northern latitudes, and extends from South Australia to Queensland. It is a small annual, whose petal-less flowers vary in colour from pale green to yellowish. *Caltha*, the 'marsh marigold' of Europe, is represented by one alpine species, *C. introloba*, with whitish flowers, which occurs in Victoria, New South Wales, and Tasmania. See CLEMATIS and BUTTERCUP.



Anemone crassifolia.

Rare Earths. See MINERALOGY.

Rat-kangaroos, a name popularly applied to a number of small diprotodont marsupials of the family Macropodidae, and comprising four genera—*Aepyprymnus*, *Bettongia*, *Caloprymnus*, and *Potorous*. All have narrow

fore-feet with large claws (the three inner toes being much larger than the two outer), the typical kangaroo hind-foot without a first toe (this in contrast to the muskrat-kangaroo, q.v.), and a long, hairy tail. The genus *Aepyprymnus* comprises only one species, *A. rufescens* (Rufous Rat-kangaroo) which is larger than the other rat-kangaroos and more wallaby-like; the length of the head and body together is about 21 inches, and of the tail about 15 inches. The long, coarse fur is reddish-gray above, whitish below; there is an indistinct white stripe along the side. The head is broad, and the longish ears black or dark brown. The rufous rat-kangaroo is not known to occur beyond New South Wales, but is there fairly common. All the rat-kangaroos stand like a kangaroo on their hind-legs, but in running use both pairs of limbs—progressing, not by a series of leaps, but by a kind of gallop, after the fashion of a rabbit. *A. rufescens* is of nocturnal habits, hiding during the day in a 'form' like that of a hare in the herbage, or in a sort of nest made under a fallen trunk or in the shelter of a bush. Its food consists not only of grass and herbage but of bulbs and roots, which it digs up with its fore-feet. More widely distributed is the common Rat-kangaroo (*Potorous tridactylus*), which is found in New South Wales, Victoria, South Australia, and Tasmania. It is smaller than the rufous rat-kangaroo, with a narrower head, and very short hind-feet. Nearly allied are the Broad-faced Rat-kangaroo (*P. platyops*), and Gilbert's Rat-kangaroo (*P. gilberti*), both of south-western Australia, and both probably extinct. The Plain Rat-kangaroo (*Caloprymnus campestris*) of South Australia is a comparatively slender form, with short ears, broad face, and thin tail sparsely covered with short, yellowish hair; it is known only from three skins and skulls in the British Museum, and is now apparently extinct. The commonest and most widely distributed of the whole group is the Brush-tailed Rat-kangaroo (*Bettongia penicillata*), which occurs all over the mainland of Australia except in the extreme north. It is about the size of a large rabbit, with short, rounded ears, elongated feet, and rather long fur of a gray-brown colour on the back, with mottlings of white and black. The tail, which is to some extent prehensile, is covered with long hairs, and has a specially developed tuft on the upper surface towards the end; it is used in carrying bundles of dry grass to line the nest in which the animal generally lies concealed and asleep during the day. An allied but larger species (*B. cuniculus*) inhabits Tasmania; and there are two other species of the same genus, Lesueur's Rat-kangaroo (*B. lesueuri*) of South and Western Australia, which has the tail scarcely crested at all and the tip almost invariably white all round, and Gaimard's Rat-kangaroo (*B. gaimardi*) of New South Wales, which has a distinct black tail-crest and the hind-feet and under-side of the tail white. See MARSUPIALS.

W.A.H.

Aepyprymnus rufescens (female).

Rats. See RODENTS.

Raven. See CROWS.

Rawson, SIR HARRY HOLDSWORTH (1843-1910), second son of Christopher Rawson, was born at Walton-on-Hill in Lancashire on 5 November 1843, educated at Marlborough, and entered the royal navy in 1857 (lieutenant, 1863; commander, 1871; captain, 1877; rear-admiral, 1892; vice-admiral, 1898; admiral, 1903). From 1857 to 1865 he served on the China station and saw the taking of the Peiho forts, the capture of Tientsin, and Peking, the battle of Palikao and a campaign in the Ningpo district. For three months he commanded 1300 Chinese troops who had been mobilized for defence against the Ningpo rebels. In 1865 he returned to England, serving in H.M.S. *Bellerophon* (1867-70), and in the royal yacht (1870-1). From 1871-5 he commanded H.M.S. *Hercules* and in 1877 was flag-captain in H.M.S. *Minataur*. In 1878 he reported on the defences of the Suez Canal, hoisted the flag at Nicosia in Cyprus when that island was annexed by Britain, and for a month was military commandant there. In 1882 he was principal transport officer in the Egyptian war. In 1895 he was appointed commander-in-chief on the Cape of Good Hope and West African stations, and in August led the expedition against M'barack, capturing Mwele. In 1896 he bombarded the palace at Zanzibar, which had been seized by a pretender, and in 1897 captured Benin. From December 1898 to 1901 he commanded the Channel Squadron, was president of the Gibraltar committee and president of the committee on torpedo-boat destroyers. On 12 February 1902 he was appointed governor of New South Wales, taking charge on 27 May, and retiring on 24 May 1909. He died in London on 3 November 1910. (C.B., 1882; K.C.B., 1897; G.C.B., 1906; G.C.M.G., 1909.) J.V.C.-B.

Rays. Though hitherto regarded as true fishes, sharks and rays have been recently considered to form a class apart, called Plagiostomi, in which the rays form the sub-class Batoidei. Plagiostomi have a wholly cartilaginous skeleton; there is no gill-cover; and five slits open from the gill-chamber. They also possess numerous other features which differentiate them from true fishes.

About 50 species of rays are recorded from Australian waters, a number of which are widely distributed over the Indian and Pacific oceans. Their young are usually produced alive, but in some families, as for instance the skates (Rajidae), eggs are deposited enclosed in tough, horny envelopes. Sexual differences are exhibited by some groups, spines being developed in the male which are wanting in the female; the teeth of male skates form sharp cusps, those of the females are flattened. All male sharks and rays are provided with large external organs attached to the ventral fins, called claspers, which serve as a conduit for the sperm-cells.

See DIAMOND-FISHES, ELECTRIC RAYS, SAW-FISHES, SHOVEL-NOSED RAYS, SKATES, STING-RAYS.

A.R.McC.

Read, ROBERT. See ART.

Real Property Act. See TORRENS SYSTEM.

Receveur, LOUIS, a Franciscan friar who accompanied La Pérouse (q.v.) on his voyage through the Pacific as naturalist and astronomer. The expedition carried with it two chaplains, the Abbé Monges in the *Boussole* and Father Receveur in the *Astrolabe*. Monges is described as a 'natural philosopher,' and Clark tells us that he was especially interested in insects. Receveur, however, was the scientific expert; he made tireless investigations in botany, geology, and the languages of the inland tribes, had in his charge 'a great number of philosophical instruments,' and on one occasion almost fired the ship by spilling acids during an experiment. At Tutuila he was among the wounded, and never recovered; in 1788, during the stay at Botany Bay, he died on 17 February, and was buried near the French camp. La Pérouse put up an inscription on a couple of boards nailed to a nearby tree; Phillip replaced this with an identical inscription on a copper plate; this disappearing, Duperrey in 1824 cut a similar inscription in the bark of the tree; and Bougainville in 1825 arranged that a tomb should be built over the actual grave. This, with a few repairs, is still in existence, but the tree has long since been cut down and the portion bearing the inscription was in 1855 presented to the French Marine Museum.

Red Bean. See DYSOXYLON.

Redbill. See WADERS.

Red Bream. See SNAPPER.

Redfern, WILLIAM (1778?-1833) is said by some authorities to have been born in 1771; but according to Bigge, who met him in 1819, he was about 19 years old when in 1797, as first assistant surgeon in H.M.S. *Standard*, he took a minor part in the mutiny at the Nore, was sentenced to death by a naval court martial, and reprieved on account of his youth. This concession could hardly have been made to a man 26 years old. In 1801 he was transported to New South Wales, and sent to Norfolk Island in January 1802; he assisted the resident surgeon until the following June, when the administrator, Lieutenant-colonel Foveaux, gave him charge of the hospital. He also acted as surgeon to the settlement until the arrival of D'Arcy Wentworth in May 1804. In 1802 he received an absolute pardon from Governor King. He assisted Wentworth and his successor until 1808, when Foveaux made him assistant surgeon to Sydney Hospital, and persuaded the colonial office to confirm the appointment on the grounds that Redfern's 'skill and ability in his profession are unquestionable and his conduct has been such as to deserve particular approbation.' This good opinion was endorsed by Macquarie, who considered 'Mr. Redfern as a Professional Man, a very great Acquisition to this Colony, his Talents as a Surgeon being far superior to those of any other Person of that Description in this Country, and perhaps equal to those of the most Skilful Medical Men in any other Country.' In 1809 Redfern made successful experiments in vaccination with virus obtained for him by Lieutenant-governor Paterson. In 1814 he reported on the incidence of mortality in convict ships, and recommended important changes which were adopted by the British government (see TRANSPORTATION). In addition to his official work at the hospital, he built up a private practice which Bigge described as 'more extensive and successful than that of any other medical practitioner in the Colony.' In 1817 he became a director of the Bank of New South Wales.

Macquarie admitted Redfern to social intercourse, but the officers of the 46th regiment refused to meet him outside government house (see MOLLE, GEORGE); the senior officers of the 48th regiment (which succeeded the 46th) were more friendly, but when Lieutenant-colonel Erskine invited him to the regimental mess the junior officers abruptly left the table—an incident which led to the promulgation of a mess rule that no officer should quit the table until the 'first thirds' had been drunk. According to Bigge, Macquarie's efforts to introduce Redfern to general society were only partially successful; Bigge attributed this to the fact that 'Mr. Redfern's . . . conduct in company, and even amongst those who were strangers to his situation, was both forward and obtrusive, and betrayed an entire forgetfulness in himself, of that occurrence in his life, which he will find it difficult to erase from the memory or feelings of others.' In May 1818, when D'Arcy Wentworth asked for leave to retire, Macquarie urged that Redfern should be appointed principal surgeon in his place; but the colonial office disapproved of Macquarie's emancipist policy, and in September 1819 it was learned in Sydney that James Bowman, a surgeon-superintendent of transports, had received the position. When Bowman took up his duties in October, Redfern retired to his 'remarkably well cleared and well cultivated estate' at Airds near Liverpool, and Macquarie appointed him to the magistracy. Bigge condemned the appointment and urged Macquarie to postpone its gazettal until the will of the home authorities was known, as he himself was not satisfied with Redfern's professional and private conduct. Macquarie, however, believing that Bigge was blinded by his prejudices against emancipists, and, considering his own honour involved, refused to postpone the appointment, but in July 1820 the colonial office ordered that Redfern's name should be omitted from the magistracy in 1821.

In 1820 a British legal decision that nothing less than a pardon under the great seal of England could give emancipists (q.v.) power to maintain personal actions or acquire property became operative in the colony. In January 1821 Redfern took the chair at a meeting of emancipists which petitioned the crown to remove these grave and unforeseen disabilities; the chairman and secretary were deputed to carry the petition to London, and left the colony on 25 October. In January 1824 Redfern's wife, then in London, petitioned the colonial secretary for a land-grant on behalf of her husband, who had then been living for some time in Madeira for his health's sake but was returning immediately to New South Wales. Redfern had then about 1400 cattle and 4000 sheep; during his absence he purchased a number of merino sheep, and procured vines and engaged a vine-dresser to return with him. He came back to New South Wales in 1824, and settled down to farming, but some years later revisited Britain, and died at Edinburgh in July 1833. A good deal of his town estate was situated in the suburb of Sydney which has since been named after him.

Red Mullet. See GOAT-FISH.

Red Perch, a beautiful pink fish (*Caesioperca lepidoptera*) with a dark blotch on each side, one of the large percoid family of Serranidae. It is plentiful in the deeper waters of the southern half of Australia, and, being often secured by the trawlers, has become a regular market-fish. It attains a length of about 12 inches, and is excellent eating. A.R.McC.

Red Rock Cod (*Scorpaena*), also known as gurnets or gurnard perch, comprise a number of useful food-fishes, usually brightly coloured, and armed with grooved spines that may have venom-glands at their bases and are capable of inflicting severe wounds. They dwell among

Red Rock Cod
(*Scorpaena cardinalis*).

rocks, and their colours often simulate those of their surroundings closely enough to facilitate the approach of some unwary crab or fish, which is immediately engulfed in their capacious mouths. Their flesh is tender, and they are prized market-fish, notwithstanding their venomous armament. The common Red Rock Cod (*Scorpaena cardinalis*) of the Sydney market attains a length of 18 inches, and is of a beautiful pink, variegated with brown and lighter markings. See ROCK COD. A.R.McC.

Redthroat. See SCRUB-WRENS.

Referenda. The referendum is the British form of the French *plébiscite*, which was invented by the leaders of the French revolution of 1789 as a means of discovering the will of the 'sovereign people;' it was a logical result of the theory that in a republic kings were replaced by the people as a whole. In Australia the referendum first came into use in connection with federation (q.v.). When the federal convention of 1891 had completed the draft constitution bill and was considering the processes by which it might be ratified, Sir George Grey proposed submission to the electors by a referendum; this was rejected in favour of Samuel Griffith's proposal to let each colonial legislature take what action it thought best for ratification. In New South Wales Henry Parkes accepted the principle of a referendum; other colonies adopted different methods—Tasmania, for example, proposed to submit the bill first to its legislature and then to a convention elected by the people. At the premiers' conference of January 1895, it was decided that the constitution bill to be framed by the forthcoming convention (that of 1897-8) 'should be submitted to the electors for acceptance or rejection by a direct vote;'—a decision was opposed by Hugh Nelson of Queensland and Sir John Forrest of Western Australia. In the enabling acts of 1895-6, therefore, provision was made for a referendum; in New South Wales it was required that the minimum affirmative vote should be 50,000 (increased in 1897 to 80,000), in Tasmania 6000, and in Victoria 50,000; South Australia made no conditions. The Queensland enabling bill, which was laid aside, reserved to parliament the right to decide whether the constitution bill should be placed before the people, and in Western Australia it was provided that the people should be consulted only after the approval of the legislature had been secured. In 1898 a referendum (for which see FEDERATION) was taken in New South Wales, Victoria, and Tasmania on 3 June and in South Australia on 4 June; during 1899 a second was held in South Australia on 29 April, New South Wales on 20 June, Victoria and Tasmania on 27 July; Queensland held its first referendum on 2 September 1899. Western Australia did not fall into line until 31 July 1900. In 1899 583,865 electors voted out of 983,000 on the rolls.

When the Commonwealth came into being, the referendum became part of its political machinery under section 128 of the constitution, which provided that amendments to the constitution must be first passed by an absolute majority of each house of parliament (or, failing agreement between the houses, by one house twice after the lapse of three months in the same or the next session), and then submitted to the electors; if the amendment is approved in a majority of the States, and at the same time by a majority of all electors voting, the constitution becomes so amended. But no amendment diminishing the representation of a State in either house of parliament, or altering the boundaries of a State, can become law unless approved in the State concerned.

A Commonwealth act of 1906 provides permanent machinery for holding referenda. The first, held on 12 December 1906, was concerned with minor alterations in connection with senate elections and senatorial service, and was carried by 774,011 to 162,470, only about 50 per cent of the electors voting. On 13 April 1910 two questions were submitted to the people, (1) whether the Braddon clause (q.v.) of the constitution, which determined the financial relations between the Commonwealth and States for a period of at least 10 years, should be amended before that time in favour of an arrangement, already agreed to by the premiers, by which the Commonwealth undertook to hand over to the States 25s. per head of the population, and (2) whether the Commonwealth should have power to take over State debts. The first proposal was rejected by 670,838 votes to 645,514, the second accepted by 715,053 votes to 586,271; of the voters on the roll 62.16 per cent voted. On 26 April 1911 two constitutional amendments were submitted to the people: the first proposed to extend the Commonwealth's powers in connection with trade and commerce, the control of corporations, industrial relations, and combinations and monopolies; the second, which commanded Labour support, gave the Commonwealth power to nationalize any industry declared by both houses of parliament to be the subject of a monopoly. Both amendments were rejected by all the States except Western Australia, the voting for the first being 483,356 in favour and 742,704 against, and for the second 488,668 and 736,392. About 52 per cent of the electors enrolled voted.

On 31 May 1913 the same proposals were submitted to a referendum as five distinct amendments, along with a sixth giving the Commonwealth jurisdiction over industrial relations in

the State railway services. All were rejected, the voting being:—

	For.	Against.
Trade and commerce	953,419	982,615
Corporations	960,711	986,824
Industrial relations	961,601	987,611
Trusts	967,331	975,943
Nationalization of monopolies	917,165	941,947
Railway disputes	956,358	990,046

Nearly 74 per cent of the electors voted; Queensland, South Australia, and Western Australia were in favour of the proposals.

On 28 October 1916 a referendum was held on the proposal to give the government power to conscript citizens for overseas military service during the war; it was rejected by New South Wales, Queensland, and South Australia, the voting (in all States) being 1,087,557 in favour and 1,160,033 against; 82.75 per cent of the electors voted. On 20 December 1917 a modified proposal was submitted, involving power to conscript men for overseas service in sufficient numbers to make the total reinforcements (including volunteers) up to 7000 per month; this was rejected by a larger majority than the first, the voting being 1,015,159 in favour and 1,181,747 against. Victoria, New South Wales, Queensland, and South Australia gave a hostile vote.

On 19 December 1919 the Commonwealth again sought extended powers in relation to industrial disputes and the nationalization of monopolies, but failed to secure sufficient support, the voting on the first issue being 911,357 for it and 924,160 against, and for the second 813,880 and 859,451. The percentage of electors voting was 64.4 and 58.7 respectively. Victoria, Queensland, and Western Australia supported both proposals. The following table shows how the States voted:—

	1916.		1917.	
	In favour.	Not in favour.	In favour.	Not in favour.
New South Wales ...	356,805	474,544	341,256	487,774
Victoria	353,930	328,216	329,772	332,490
Queensland	144,200	158,051	132,771	168,875
South Australia	87,924	119,236	86,663	106,364
Western Australia ...	94,069	40,884	84,116	46,552
Tasmania	48,493	37,833	38,881	38,502
Federal Territories ...	2,136	1,269	1,700	1,220

The cost of taking the referenda was £76,640 and £85,385 respectively.

Refrigeration. See MORRISON, JAMES.

Regent-bird. See BOWER-BIRDS.

Reibey, THOMAS (1769-1811), is first heard of as an officer of the East India Company's transport *Royal Admiral,* which on 7 October 1792 reached Port Jackson with convicts. He left the vessel to settle in the colony, and soon became a prosperous merchant and shipowner; in 1804 he owned the *James* and the *Raven,* sloops trading to the Hawkesbury and the Hunter, and in 1805 entered into partnership with Edward Wills and had vessels sealing in Bass Strait. Both he and his partner died in the prime of life during May 1811—Reibey on the 5th, Wills on the 14th.

Not Reibey, however, but his wife was the notable member of the family. Mary Haydock, born near Blackpool in Lancashire on 12 May 1777, was the daughter of well-to-do folk, but at the age of 13 in a madcap frolic caught a neighbour's pony and rode it some miles; brought before a local magistrate, she was sent to trial, convicted of stealing the horse, and sentenced to seven years' transportation. (This 'horse-stealing' incident has been the source of much confusion, as it caused Mary Haydock to be identified wrongly by careless writers with Margaret Catchpole (q.v.), who was also sent out for horse-stealing, but in very different circumstances.) Mary Haydock's name is not on the list of female convicts transported in the *Royal Admiral,* but other documentary evidence shows that she came out in that vessel; she may have been shipped under an assumed name, or sent out as an 'exile'—and therefore not officially a convict—as were other obviously hardly-used victims of the penal laws of that period. At any rate Reibey met her in the *Royal Admiral,* fell in love with her, looked after her during her first years in Sydney, and on 7 September 1794 married her. An excellent business woman, she carried on her enterprises—a bakery and a general store with wine and spirit licence—side by side with her husband, and after his death took over the shipping business also. By 1816 she had a house and store in George-street, another in Macquarie-place, a third in Cockle Bay, and seven large farms on the Hawkesbury. In 1820 she was able to revisit England, and after her return to Sydney seems to have lived quietly on her income—at first in Macquarie-place, but from the middle of the forties onwards in Newtown, where she died on 30 May 1855.

Her eldest son, Thomas Reibey, after a short term as master of one of his father's vessels, settled in Tasmania about 1820, farming land near Westbury and running a store in Launceston; his brother James obtained an adjoining land-grant, but settled in Hobart and became a prominent merchant there. Thomas's son, a third Thomas (1821-1912), had a variegated career; educated for the Church at Oxford, he rose to be an archdeacon, but in 1873 abandoned this profession and in 1874 entered Tasmanian politics as member for Westbury. In 1875 he led the opposition, formed a ministry in 1876-7, led the opposition again in 1877-8, and in 1878-9 was colonial secretary in the Crowther ministry. From 1887 to 1891 he was speaker of the Tasmanian assembly, and in 1894-9 a member without portfolio of the Braddon ministry that carried federation. In 1899 he retired from public life and spent his time quietly at Entally, his father's original grant near Westbury, Tasmania. He died on 10 February 1912, and with him the family name died out in Australia. W.J.

Thomas Reibey the first was undecided about the spelling of his name. In official documents of his time it is spelt Raby, Reiby (which became the favourite official spelling), and rarely Reibey. On his marriage certificate it appears as Rabey. A street in Sydney named after him is Reiby Lane. But the only actual signature of his that is now available for inspection—that to his will—is 'Thomas Reibey,' and that spelling was used after his death by his widow and descendants; it is therefore adopted here.

Reid, SIR GEORGE HOUSTON (1845-1918), born at Johnstone in Renfrewshire, Scotland, on 25 February 1845, was brought by his parents to Australia in 1852; in 1858 he entered a Sydney merchant's office as clerk, and in 1864 was made an assistant accountant in the colonial treasury. On the advice of

Sir Julian Salomans he began to read for the bar, and in 1874 issued a pamphlet containing five freetrade essays which gained him an honorary membership of the Cobden Club and (later) its gold medal. In 1878 he was made secretary to the crown lands office, and in 1879 admitted to the New South Wales bar (Q.C., 1898). In 1880 he was elected by East Sydney to the legislative assembly, and in October 1881 moved for 'a full and searching enquiry into the land laws of the colony;' the Parkes-Robertson ministry failed to checkmate him, and was forced to resign. Reid became minister of public instruction in the Stuart ministry, and introduced a system of public secondary education from which that of to-day has developed (see EDUCATION). When in 1887 the Jennings ministry was defeated, Parkes offered Reid a seat in his cabinet; he refused it, and while nominally supporting the ministry severely criticized Parkes's efforts to further the cause of federation; he said afterwards that he had torn the bill of 1891 'to shreds' because New South Wales could not federate without abandoning her freetrade policy. Discovering, however, that the movement towards federation could not be stayed, he hastened to give it as democratic a tendency as possible. In the meantime Parkes's ministry was defeated, Parkes felt himself too old to lead an active opposition, and Reid was chosen by the party to fill his place. Parkes, who had intended to retire, remained in parliament to keep a check on 'the enemy of federation.'

When in 1894 the Dibbs ministry went out of office, Reid became premier. This was the culmination of his career. Abandoning the extravagance of his predecessors, he endeavoured to replace the colony's finances on a sound basis; to remove the public service from political control, he created a non-political board in which were invested all appointments and promotions; to break up the aggregation of big landed estates whose owners did not make full use of the soil, he introduced a land tax based mainly on the owners' own valuation of their property, but was unable to add to it the important proviso of New Zealand permitting the government to buy any estate at the owner's valuation for tax. With the support of the Labour party he remained in office till 1899; then, dissatisfied with his failure to pass legislation which it desired, that party transferred its allegiance to Sir William Lyne—an action which in 1900 deprived him of the prime-ministership of the Commonwealth, since it was first offered to the premier of the senior colony.

Reid's attitude towards federation was not always decidedly favourable. But as premier of New South Wales in 1895 he supported a popular Australian movement and persuaded his fellow-premiers to agree that the next federal convention should be chosen by the electors, not by the parliaments, and the constitution submitted to the electors for approval. This made federation both possible and genuine, founding it on the felt need of the ordinary man, not on the compromises of politicians. He also played no small part in the popularly elected convention which framed the draft constitution. When the constitution came to be voted on in 1898, he publicly explained its defects from the freetrade point of view before promising to support it; no doubt his criticism had much to do with the check which the movement received from the result of the New South Wales referendum in 1898, but after a premiers' conference had agreed to amendment of the draft in resepect of the capital, customs, and excise revenue, he wholeheartedly supported the bill and helped to secure its acceptance by New South Wales in the referendum of 1899. He entered the first federal parliament in 1901 as member for East Sydney and leader of a strong (mainly freetrade) opposition. Protection was the Barton ministry's fiscal policy, but Reid's skill ensured the lowering of many duties. In the second parliament he in April combined with the Labour party to defeat the Deakin ministry, in August with Deakin to defeat Labour, arranged with Deakin to sink fiscal disputes during the life of the parliament, and formed a coalition ministry with Alan McLean as representative of Deakin's followers. In June 1905, however, the alliance with Deakin ended and Reid went out of office. For the rest of his political life in Australia, he contented himself with a spasmodic leadership of the opposition, leaving most of the parliamentary work to his lieutenant Joseph Cook (q.v.). Towards the end of 1908 he retired from Australian politics, and in 1909 was appointed high commissioner for the Commonwealth, taking up his duties in London on 26 February 1910. There he became very popular, and, mainly by his excellence as an after-dinner speaker, brought Australia into prominence among Londoners.

When the war of 1914-18 broke out, he was instrumental in having the Australian Imperial Force trained in Egypt, pointing out to Lord Kitchener that the passage from an Australian spring to an English winter would seriously interfere with the health of the troops. In January 1915 his term of office expired; his offer to continue in office without salary was not accepted, but he was reappointed for 12 months more. A few days before the expiry of this second term, he was offered a seat in the house of commons, and on 15 January 1916 was returned without opposition for Hanover Square. He died in London on 12 September 1918. (P.C., 1897; K.C.M.G., 1909; G.C.M.G., 1911.)

Rennie, EDWARD HENRY, born at Balmain near Sydney on 19 August 1852 and educated at the Sydney grammar school and the university of Sydney (B.A., 1870; M.A., 1876), taught at the Sydney grammar school in 1871-5 and the Brisbane grammar school in 1876-7. In 1878 he went to the university of London (D.Sc., 1881), and during his stay lectured in chemistry at various institutions. In 1883 he returned to Australia to become an assistant in the New South Wales government laboratory, and in 1885 was appointed to the Angas professorship of chemistry at the university of Adelaide, which chair he still (1926) holds. He is a member of the university council and president of the Australian Institute of Chemistry, he has been twice president of the Royal Society of South Australia, and in 1925 was president of the Australasian Association for the Advancement of Science.

Rentoul, JOHN LAURENCE (1846-1926), born at Garvagh in Ireland on 6 July 1846 and educated at Queen's College, Belfast, Queen's University, Dublin, and the university of Leipzig (B.A., 1867; M.A., 1868; D.D., 1884), was in 1871 admitted to the Presbyterian ministry, and after seven years' work at Southport in Lancashire migrated in 1879 to Victoria, where for five years he ministered to St. George's at East St. Kilda, Melbourne. In 1884 he was appointed professor of Exegetics and Apologetics at the theological hall connected with Ormond College

in the university of Melbourne; afterwards he was appointed professor of New Testament Greek and Apologetics, which chair he held till his death. In 1913-19 he was a chaplain-general in the Commonwealth military forces, and in 1916-17 served as chaplain at the front in France. He died at Melbourne on 15 April 1926.

Rentoul was a man of wide reading and brilliant scholarship, and an authority on Apologetics, New Testament Greek, and the first four centuries of Church history. But he was chiefly interested in the practical work of the Church; he was an able and sometimes vehement controversialist with a conservative bent, in 1885 leading the attack on the theological Hegelianism of Charles Strong (who thereupon seceded and founded a practically Unitarian 'Australian Church'), and in 1924 contending with equal zeal against proposals for a union of the Congregational, Presbyterian, and Methodist churches of Australia. For over 40 years he was one of the most picturesque personalities in Church life. Besides his controversial writings he was the author of three books of verse and of a book against the Roman Catholic claims. (O.B.E., 1917.) T.J.S.

Repatriation. The Commonwealth department of repatriation entered upon its functions in April 1918, when 44,671 men had been discharged. At the end of June 1920 when practically the whole of the survivors were back in Australia and all but 2037 men (still retained in hospitals) had been discharged, only 6049 men were awaiting re-establishment in the ordinary avenues of civil activity; for those whose war disabilities rendered them subjects for extended after-care, and for the dependants of the fallen, the nature and scope of the necessary provision had already been determined. Beyond the pension provision there were, at the beginning of the war, no official ideas as to what could or should be done to restore to civil life the men who returned. The first great emotional impulse expressed itself not in a call for government action but in a widespread voluntary effort to raise large funds. The first general appeal was in behalf of the Australia Day Fund in New South Wales—a fund which quickly rose to £800,000. Similar appeals in the other States met with generous response. It was at this stage that the first official movement was made. The Commonwealth parliament had appointed a federal war committee representative of all sections of the house. It was the primary function of this committee to supervise recruiting and generally to keep in touch with all activities concerning the army. Realizing that some official organization to care for the men who returned was necessary, the committee formed 'war councils' in each State. These councils, which worked under the auspices of the committee, were composed of representatives of all sections of the various State parliaments, as well as representatives of commercial, industrial, and civil interests. The Federal War Committee was represented in each State council by those of its members who sat for constituencies in the particular State, and the war councils organized for their assistance 'war service committees' for every local governing area. The work of the councils was to keep a register of all men discharged, and to concern themselves with such matters as (*a*) the collection and distribution of funds, (*b*) the finding of positions for men able to take employment, (*c*) the registration of men desirous of settling on the land, and the notification of the lands department, (*d*) the formation of local bodies throughout the State to act as auxiliaries to the central body; also to assist men settling in the district to bring holdings quickly into a producing condition. These local bodies also watch over the interests of dependants.

The war councils functioned till the end of March 1918. They formed a large number of committees and did a vast amount of useful work; but at a very early stage it became manifest that although they were given much work to do, they were supplied with no funds with which to do it. Their activities, therefore, were restricted to finding employment.

The Commonwealth government, in May 1916, passed the Australian Soldiers' Repatriation Fund Act which provided for a board of trustees composed chiefly of members drawn from both parties in parliament. The prime minister was ex-officio chairman. The act gave the trustees a charter to appeal for money, to be distributed through the war councils.

Following on to a suggestion for a general appeal, the executive submitted the 'Anzac Week' scheme. This scheme contemplated an organized effort on the part of the manufacturing industries of the Commonwealth to produce in wholesale quantities definite lines of articles required for the establishment of returned men, e.g. clothing, furniture, and farm implements. The primary industries were also brought in, the repatriation fund finding the cost of the raw materials where necessary. But Anzac week, like the general appeal, was held in suspense pending a suitable opportunity for action. Meanwhile the public sentiment, which in the beginning had seemed so definitely on the voluntary side, underwent a change, and the government announced the policy of raising £10,000,000 by means of a special wealth levy. This ultimately gave place to annual appropriations by parliament.

To a conference of premiers and land ministers in January 1916 the trustees submitted definite recommendations for the direct control of all activities (with qualifications as to land settlement, which primarily was an affair of the States) by the Commonwealth authority, together with a detailed indication of the scope of the work which they considered should be embraced by an adequate scheme. With minor amendments those recommendations were adopted by the conference. Subsequently the trustees advised the prime minister that the department should be administered by commissioners. Although the executive of the board of trustees was hampered by the limitation of finance and the type of organization which the act compelled it to adopt, its short experience was most valuable in focussing the essentials of the problem and providing the department with a useful basis for the comprehensive scheme which was subsequently elaborated. As a preliminary to giving effect to the resolutions of the premiers' conference, the Commonwealth government early in 1917 appointed Senator Millen minister in charge of repatriation.

Pending the passage of enabling legislation a survey was made of the many private activities then existing. There was much overlapping, and the confusion and dissatisfaction arising therefrom had an unfavourable effect upon recruiting. At a conference in July 1917 it was agreed that assistance should be granted to the

SYDNEY HARBOUR BRIDGE NOW BEING CONSTRUCTED (1926).

LOCKYER CREEK BRIDGE, QUEENSLAND, BUILT OF REINFORCED CONCRETE.

HAWKESBURY RIVER RAILWAY BRIDGE N.S.W.

TYPICAL TIMBER TRUSS BRIDGE, MINNAMURRA, N.S.W.

LIFT BRIDGE AT MURWILLUMBAH, TWEED RIVER, N.S.W.

CURVED WOODEN BRIDGE AT ST. HELENS, TASMANIA.

[See VIADUCTS AND BRIDGES.

soldier from the date of his return to the date of his discharge at a rate to bring the income, inclusive of weekly pay, up to, for a single man, 50s.; man and wife, 65s.; first two children, 5s. each; additional children, 2s. 6d. per week each; with provision for special grants in special circumstances. For dependants of men on service the rate was to bring the income of the wife up to £1 0s. 11d. per week, with increases for each child up to the number of eight, when the weekly income would be £2 19s. Payments were to begin from the soldier's entry into camp and to be continued till he died (in which case the dependants became eligible for pensions) or until he returned to the State in which he lived. Although the agreement was not observed in its entirety in all the States, uniformity of treatment was secured and the way was cleared for the Commonwealth scheme.

The Australian Soldiers' Repatriation Act was passed in the latter half of 1917 and provided for assistance to the men (and nurses) and their dependants. It defined the term 'Australian soldier' to cover any Australian who had served in the military or naval forces in any part of the king's dominions, provided he or she could prove domicile in Australia. Responsibility for the administration was vested in the minister; advising him was an honorary commission of seven members whose function was to make recommendations and to determine appeals. Associated with the commission were honorary boards of seven in each State (whose function it was to adjudicate upon applications) and a network of local committees covering the Commonwealth. The executive side of the department was represented by a comptroller, with a deputy in each State. The initial difficulty was that the commission could not tell what money would be at its disposal, or the number of persons who would apply for or need assistance. In those circumstances it decided to do no more than formulate a scheme, honouring the spirit of the act and calculated to cover all reasonable needs, leaving to parliament the liquidation of the bill as it fell due. At the outset it was necessary to define 'eligibility.'

The previous regulations framed by the repatriation trustees excluded (*a*) those who had not received an honourable discharge; and (*b*) those who were deemed to have adequate means. The commission, however, thought it wiser to assign no limits to the right to apply. The next step was to arrive at some principle of treatment which would govern the whole scheme. Eventually the commission's decision found expression in the following formula:—

> That the Department accept as a minimum obligation the responsibility of providing the returned soldier with the opportunity of earning at least a living wage, and that until such opportunity is forthcoming such sustenance payments will be made as will insure the individual securing at least the living wage. Further, that, as far as possible, the Department will assist in restoring the individual to an economic condition comparable with that occupied prior to enlistment. The living wage is to be understood as that judicially fixed or generally recognised for the part of the Commonwealth in which the soldier may happen to be at the time.

The 'living wage' basis had the advantage of being generally understood and generally applicable. It guaranteed a minimum expressed in monetary payments, while it did not relieve the department of the obligation to seek the restoration of the individual to as much above the minimum as circumstances would permit.

The commission decided that re-establishment would involve expenditure in relation to the following matters:—sustenance while awaiting employment; sustenance while undergoing training; sustenance while under treatment or care in hospitals or special institutions; sustenance while awaiting the allotment of land and (in the case of settlers) during the initial period of land occupancy; medical treatment after discharge, including the provision of artificial limbs and other surgical aids; emergency grants to cover exceptional necessities; fees to educational institutions; tools of trade, professional instruments, and personal equipment; small businesses, plant, and live stock; homes; passages (to and from the Commonwealth); transportation (within the Commonwealth); allowance to dependants; and funeral expenses.

Although the first pension schedule had been increased, it was obvious that the pension alone was insufficient for maintenance, even where the full rate was paid. The partially incapacitated received only a proportionate amount; many were discharged without pensions at all. It therefore became necessary to determine rates of sustenance which, inclusive of any pension there might be, would represent a reasonable living allowance. The commission determined that all men registered for employment could claim as a right a sustenance allowance until suitable employment could be found for them, and decided that justice would be done if single men were paid at the rate which the military would have paid them had they not been discharged, namely 42s. per week, with allowances for married men up to 65s. The same rate was fixed for those undergoing training in technical institutions. The scheme provided also for training in private workshops, and an agreement by an all-Australian conference of employers and trade-unions required that the trainee should receive the standard wage of the particular trade, the department to make up the difference between that and the value of the labour, such value being computed initially at 40 per cent of the standard and ascending as efficiency increased. The commission at first decided that this supplemental payment should be inclusive of pension, and the first payments were made on that basis; but strong protests were made against the pension being taken into account, and the industrial organizations supported them. The cabinet in this instance overruled the commission, not on the ground advanced by the men, but because of the anomalous position which would be created as between pensioned men and unpensioned men in the same workshops. At a late stage of the war an extension was decided upon to meet the case of those who had gone away as youths and would come back men. The commission therefore decided to provide opportunities for training all who had enlisted under 20. The extension of the sustenance provision to this large new class (some 20,000) entailed a revision of the ideas previously entertained as to the scope of the training effort. Sustenance provision was also made for the childless widow who wished to qualify for a definite calling, but to this class little encouragement was given.

The commission laid it down that if a man had to relinquish his occupation because of a war disability his medical treatment was to be a charge on the department, but restricted the allowance to the man with dependants. The man without dependants was expected to rely entirely on the pension, but if his treatment

did not include his maintenance he received an allowance. Sustenance at the ordinary rates was allowed to men awaiting land, with limitations as to time, and during the period which might elapse between his having a holding allotted to him and his going into possession. It was also found advisable to make an allowance to help the settler over the non-productive stage of occupancy. This, however, was at the lower rate of 20s. per week with, in the case of the married man, 10s. additional for the wife and 2s. 6d. for each child to the number of four, the period not to extend beyond six months.

The necessities of incapacitated soldiers and of widows with children at first prompted the provision of rental allowances pending the minister's projected development of policy for the erection or acquisition of dwellings. But this rental allowance subsequently gave place to a general allowance, which embraced the classes mentioned and also widows without children who were physically unfit to augment their pension by personal earnings.

The department was deluged with representations on behalf of persons of almost every degree of relationship. Eventually provision was made for allowances, on carefully adjusted scales, to the following classes:—(*a*) totally and permanently incapacitated soldiers; (*b*) widows of deceased soldiers; (*c*) mothers of deceased unmarried soldiers who were widows and were dependant on soldier prior to his enlistment; (*d*) mothers of deceased married soldiers, or mothers of totally and permanently incapacitated married soldiers who were widows and dependant on soldier prior to enlistment; (*e*) mothers of deceased unmarried soldiers who (1) have husbands so incapacitated as to be unable to contribute materially to their support, (2) were married to such husband prior to soldier's enlistment; and (3) were dependant on soldier prior to enlistment; (*f*) mothers of deceased or totally and permanently incapacitated married soldiers who (1) have husbands so incapacitated as to be unable to materially contribute to their support, (2) were married to such husband prior to soldier's enlistment, and (3) were dependant on soldier prior to enlistment; (*g*) incapacitated fathers of deceased unmarried soldiers where such soldiers contributed to support prior to enlistment; and (*h*) incapacitated mothers of deceased or totally and permanently incapacitated married soldiers who (1) have husbands so incapacitated as to be unable to materially contribute to their support, (2) were married to such husband prior to the soldier's enlistment, and (3) were dependant on soldier prior to enlistment.

The children of deceased or totally and permanently incapacitated soldiers for whom secondary or technical education might be desired were provided for by an allowance of 20s. per week for boy or girl from the age of 16 to 18. Up to 16 the children were covered in the allowances made to the parents or to guardians where both parents were deceased. Beyond 18 the act did not empower the department to go.

A part of the scheme which excited much protest was that relative to establishment in small businesses. The repatriation trustees had spent an appreciable sum in financing small businesses, and the result had been depressing. Recognizing this, the trustees had endeavoured to restrict advances to a minimum. The commission concurred, and framed a regulation to provide for loans up to £150 in ordinary cases (in special cases up to £250 with the approval of the minister) for the purchase of business, plant, stock, or live stock, but restricted the eligibility to apply to (*a*) a widow with one or more children; (*b*) a married soldier incapacitated to the extent of being unable to engage in his usual occupation; or (*c*) a soldier who, immediately prior to enlistment, had a business and disposed of it in order to enlist. Subsequent experience suggested further restrictions.

In every State applications for assistance to build or buy homes or to convert mortgages had been numerous. In New South Wales the early needs were met by 'working bees,' which built houses on crown land provided by the State government or on blocks privately presented, the State savings bank making an advance to cover cost of material and subsequently taking a mortgage over the building with long terms for repayment. The government of New South Wales went a stage further, undertaking to erect dwellings for widows and incapacitated men, giving a life tenancy at a pepper-corn rental. The definition of 'incapacity' rested entirely with the minister. In default of a dwelling the New South Wales government granted a rental allowance of 12s. 6d. per week. Few dwellings were erected, but a number of rental allowances were paid, and this liability had to be taken over by the department, and met by the system of living allowances already referred to. Some assistance towards the purchase of homes, in co-operation with the State banks, was made by the repatriation trustees, but the commissioner took the view that the question of housing should be considered comprehensively and separately by the Commonwealth, and subsequently the Soldiers' Homes Act was passed.

The commission helped to establish those who were, or contemplated being, married, by granting loans for furniture and furnishings up to £35. Provision of passages was also made for girls to whom soldiers had become engaged abroad. Such passage-money was issued only on the application of the soldier, who had to undertake to refund it if marriage did not take place within a month of the fiancée's landing. Up to June 1920 some 14,000 passage-warrants had been issued.

The scheme covered many other forms of assistance. A grant of £10 might be made for tools of trade, professional instruments, or articles of equipment necessary to enable a man to engage in some occupation; if not eligible for vocational training, but anxious to enhance his efficiency or to qualify for some other calling in his own time, he was entitled to have his fees paid to evening classes, and to be provided with books and instruments. If employment at a distance necessitated his removal and that of his family and belongings, an allowance was made towards the cost of transportation.

In 1921 the scheme was extended to cover the education and training of children of deceased and totally and permanently incapacitated soldiers in secondary and technical schools with a view to their equipment for industrial, commercial, agricultural, or professional occupations. While a student or trainee, each child received a maintenance allowance of from £26 per annum, at the age of 13 years, while living at home, increasing according to the child's age, and from £62 per annum if living away from home. It was estimated that 11,791 children were eligible and the total cost, spread over 20 years, would be £1,250,000. While the repatriation act limited assistance to soldiers' children to 18 years, provision was made for the further four years out of subscribed funds.

Other extensions were the allowance, in addi-

tion to pension, of £1 per week to a blinded soldier for an attendant; the same to a married soldier suffering total incapacitation for a longer period than three months; while to an unmarried soldier, assessed at 65 per cent of total incapacity and thus unable to engage in regular employment, an allowance was paid sufficient to ensure him an income of £2 2s. per week. Furthermore the widows and orphans of soldiers whose death was due to war service, and widowed mothers of such deceased unmarried soldiers, could be provided with medical treatment and medicines.

Pensions did not become the concern of the repatriation authority until 1920, so the scheme of provision was developed apart from them, although, where they were being paid, the amount of the pension was taken into account.

The department never assumed any responsibility for land settlement. The States controlled the lands, and the arrangement was that settlement should be their affair. At first they undertook to do what was necessary without reference to the Commonwealth. Then it was agreed at a premier's conference in February 1916 that the Commonwealth should provide on loan the money for settlers' improvements up to £500 in any one case. Later an extension of the amount to £625 was agreed on. That agreement (January 1919) contemplated the settlement of 20,885 men at a cost to the Commonwealth of £28,184,000. A year later the States represented that the estimates had grown to £74,000,000. As this was more than the finances would bear, the Commonwealth limited the advance for settlers additional to the quotas previously considered for each State, to £1000 per settler—this sum to include both cost of land and advances.

The provision of dwellings became an important part of the repatriation work; at the commencement it was the concern of a commissioner administering a special act, but subsequently it was made a function of the chairman of the repatriation commission. The act aimed at bringing a desirable type of dwelling within the reach of every returned soldier (or sailor or nurse) and war widow, members of the Y.M.C.A. who had served abroad, and civilian seamen and wireless operators who had served in the war zone. The housing act had two main sections. The commissioner was empowered to purchase homes, or build, or lift mortgages. Or he could build large numbers of houses in anticipation. Much litigation and financial trouble occurred over this provision, but it provided many thousands with dwellings at a minimum cost. The interest charge was 5 per cent, with 1 per cent sinking-fund, and the repayments extended from 20 to 37 years according to the class of building. The war service home could be transferred, but there were safeguards against speculative trafficking.

The department was administered by a comptroller (subsequently replaced by a commission of three), subject to the minister, with, in each State, a deputy-comptroller who superintended the offices in which the detailed work was accomplished. The offices were at first confined to the capital cities, but sub-branches were afterwards established in the more populous centres. Branches and sub-branches were linked up with the local committees, covering the whole of each State.

As it had been decided that the office staff should be returned soldiers, the majority of whom would be without experience of official work, it was necessary to design a system which would embrace every activity, define the duties of every officer, and lay down in detail the manner of his doing it. The system took months to fashion, and underwent modifications and adjustments under the pressure of rapidly expanding work, but the fact that it enabled a raw staff to discharge manifold and unfamiliar duties throughout the Commonwealth justified the immense amount of thought which had been bestowed upon its elaboration. The system provided for the registration of every returned man and endeavoured to find suitable employment for those able to work. The greatest difficulty was to find sufficient 'light labour' jobs as an introduction to more strenuous ones later on. An enormous number of applications were handled and, on the whole, with satisfactory results.

For vocational training the utmost use was made of facilities controlled by the States, the department providing the cost of accommodation, staff, and equipment rendered necessary for soldier students and trainees. The department also equipped training establishments of its own, and made arrangements for training in private workshops, where industrial committees were formed consisting of two employers and two employees, and in every case a representative of the department. These committees satisfied themselves as to the suitability of men for particular callings, and assessed the value of their labour, thus periodically determining the proportions of the standard wage which had to be paid by the employers and the department respectively. Associated with the committees was a central industrial committee for each State, whose authority might be evoked in case of dispute. Altogether, training was conducted in 179 professions, trades, and callings.

Soon after the conclusion of the war the department assumed responsibility for all medical treatment, established a number of special hospitals and institutions, and made comprehensive arrangements with civilian hospitals. For the totally and permanently incapacitated, a hostel, in pleasant surroundings and generously equipped, was established in each State. Special sanatoria were provided for the tuberculous and special arrangements were made with State authorities for mental patients.

To the end of June 1925 the Commonwealth expenditure in repatriation had amounted to £154,139,106, made up as follows:—

	£
War pensions	51,100,382
General benefits	18,411,785
Houses	22,153,787
Land settlement	35,001,941
War gratuities	27,471,211

Pensioners (soldiers and dependants) numbered 244,597, classified as follows:—

Soldiers	72,128
Wives	50,106
Children	84,137
Widows	6,453
Widowed mothers	8,943
Other mothers	17,463
Fathers	3,308
Sisters and brothers	872
Others	1,187

At June 1925, 25,721 men had completed courses of training, leaving 1387 still in training; the cost was £4,827,552. Employment applications numbered 246,734, and the incidental cost, including sustenance payments and advances to States and municipalities, was £3,406,372; £2,928,688 had been spent on medical treatment. The number of men returned as settled on the

land was 34,995, involving a Commonwealth commitment of £35,001,941. Other expenditures were:—

	£
Furniture	1,105,435
Small businesses, plant, etc.	416,371
Living allowance to certain dependants	875,923
Sustenance, fares, etc., to land settlers	612,251
Free passages beyond the Commonwealth	508,554
Education of children of deceased and totally incapacitated men	336,943
Miscellaneous	731,707

It is on these figures of expenditure, as well as on the method and scope of application of that expenditure, that the Commonwealth government has claimed for its scheme of repatriation that it is generous and comprehensive beyond that of any other country whose troops engaged in the great war. D.J.G.

Reptiles, cold-blooded vertebrate animals breathing by means of lungs, intermediate in the animal kingdom between amphibians on the one hand and birds on the other, but more nearly related to birds. In reptiles the occipital condyle, by means of which the skull is articulated to the vertebral column, is almost invariably single; the lower jaw (mandible) is composed of several bones, and is connected with the skull by means of a quadrate bone; the teeth are usually conical, and not differentiated (as are those of mammals) into incisors, canines and molars. Tortoises have no teeth. The brain is relatively small and elongated. The legs are usually short, and the body is raised but little from the ground. Most reptiles are oviparous, but in many species the young are born alive, being literally hatched within the body of the mother. The body is usually covered with epidermal scales, which occasionally overlie bony scutes; neither feathers, the characteristic of birds, nor true hairs, a distinctive feature of mammals, are ever present.

Australian reptiles now existing include tortoises and turtles, lizards, snakes, and crocodiles, all here described under their own names. The only present-day reptilian order not represented in Australia is the Rhynchocephalia, which is confined to New Zealand. Lizards and snakes are often united as sub-orders of the order Squamata (scaly reptiles).

Much of the earlier work on Australian reptiles was done by Krefft, Macleay, McCoy, De Vis, and J. D. Ogilby. Krefft's *Snakes of Australia,* published in 1865-9, is now rarely obtainable. Systematic descriptions of species are to be found in the British Museum catalogues (by Boulenger) of Chelonians (1889), Lizards (3 vols., 1885-7), and Snakes (3 vols., 1893-6). A popular account of Australian snakes by Edgar R. Waite was published in 1898. Lucas and Le Souef's *Animals of Australia* (1909) contains notes on the chief species. Gadow's 'Amphibia and Reptilia' (*Cambridge Natural History,* 1909) is an excellent textbook on general lines. More recent work may be found in the publications of the Australian museums and of scientific societies. In 1906 the department of public health (New South Wales) published a handbook by Tidswell, *Australian Venoms.* H.A.L.

Reynolds, Christopher Augustine (1834-1893), born in Dublin on 25 July 1834, and educated at Clondalkin and in the Benedictine monastery of Lublace near Rome, accompanied Dr. Serra (q.v.) to Western Australia in 1855, and was transferred in March 1857 to South Australia. Here in April 1860 he was ordained priest by Dr. Geoghegan, did parochial work at several stations in the diocese, administered the diocese when Dr. Sheil died in 1872, and on 2 November 1873 was consecrated bishop of Adelaide by Archbishop Polding. In 1887 he became Adelaide's first archbishop. Throughout his life he was an indefatigable worker—in the first six years of his episcopate he travelled nearly 53,000 miles within the colony—and a strong advocate of total abstinence. He died on 12 June 1893.

Reynolds, Thomas (1818-1875), born in 1818, was in his early manhood a preacher and worker for the Methodist Church in England. In 1840 he migrated to Adelaide, carried on a drapery establishment for some years, then became a grocer, and later on worked for some time on the goldfields. On his return to South Australia he pioneered the jam-making industry, grew fruit on an extensive scale, and was one of the first orchardists to grow and market sultana grapes. In June 1854 he was elected to the legislative council of South Australia, and in 1857 was returned to the first legislative assembly under responsible government. On 30 September he joined the Hanson ministry as commissioner of public works, but left office in June 1858. When the Hanson ministry went out of office in 1860, he became premier with George Waterhouse, Henry Strangways, John Bagot, and Alexander Hay for colleagues. In the perturbed period of South Australian politics which followed—11 ministries being formed between May 1861 and March 1866—Reynolds was twice premier and treasurer (1860 and 1861), and twice treasurer under other premiers (Waterhouse in 1861-2 and Dutton in 1865); Ayers also chose him for treasurer in 1867-8 and for commissioner of crown lands in 1872-3. His naturally restless mind, sanguine temperament, and vigorous constitution account for his eager but spasmodic participation in very varied enterprises, public and private, as well as for his comparative ill-success. In 1873 he moved to the Northern Territory in the hope of restoring his fortunes. Failing there also, he was on his way back to Adelaide when on 24 February 1875 the *Gothenburg,* in which he had embarked, struck a reef in Torres Straits, and he with over a hundred other passengers was drowned.

Rhamnaceae, a large family of shrubs and trees (rarely herbs), dispersed over tropical and temperate regions. Twelve genera with 96 species are indigenous to Australia. *Colubrina* is largely an American genus; one species, *C. asiatica,* is indigenous, ranging from Queensland to northern Australia and extending to Asia. The natives of Fiji use the leaves of this shrub for cleansing their hair and destroying vermin. *Alphitonia excelsa* (Red Ash or Leather Jacket), ranges from southern New South Wales to northern Australia, and extends to Malaysia. It is a tree of 50-80 feet, with numerous small flowers and globular fruits, found chiefly in the coastal brushes, but occasionally crossing the dividing range. Its foliage is ravenously devoured by stock in time of drought. Its timber, when fresh-cut, resembles that of the English ash, but in the course of a few months its colour changes to bright red—one of the most remarkable instances of colour-change in Australian timbers. *Emmenospermum* has 2 endemic species; *E. alphitonoides* is a tree up to 130 feet, which yields a useful timber. *Pomaderris* is confined to Australia and New Zealand; it has 21 indigenous species, chiefly shrubs, many ornamental. *P. apetala,* a small tree, extends from South Australia to New South Wales. The leaves of *P. racemosa* are mucilaginous and very

much relished by stock. See VENTILAGO, ZIZYPHUS.

Rhodes Scholarships. The most far-reaching system of scholarships the world has yet seen is that administered by the Rhodes Trust. By his will Cecil John Rhodes, who died in 1902, endowed scholarships at Oxford for students from 12 British states and dominions, a number of crown colonies, the United States, and Germany. The German scholarships were cut off by act of parliament in 1916 and allocated to various British dominions. The scholarships are for three years, tenable at any college at Oxford. Originally of the annual value of £300 each, the trust by additions made in 1921 and 1925 made them worth £400. One is awarded each year in each State of the Commonwealth of Australia, which thus sends six scholars per annum to Oxford, and as each scholarship is tenable for three years there are at any given time 18 Australian Rhodes scholars. From time to time additional scholarships are allotted by the trust. In each State the final selection rests with a committee of seven, including the State governor, the chief justice, and representatives of the university. In choosing the scholars regard is paid to (1) literary and scholastic qualifications; (2) sports; (3) moral qualities; (4) force of character and leadership. Candidates are eligible who are between 19 and 25 and have passed the second year in some university. The first Australian scholars went to Oxford in 1904, and a few ex-scholars have settled overseas; very few of the Australians have attempted to enter politics, and only one or two of those who put up for parliament have been returned.

T.D.

Ribbon-fern. See FERNS.

Ribbon-fishes belong to the order Allotriognathi, sub-order Taeniosomi, but the relationships of the true ribbon-fishes are very uncertain. Their bodies are greatly compressed and elongated, sometimes reaching a length of over 20 feet. They are covered with a delicate

Regalecus glesne.

silvery skin which is beset with small bony tubercles, and their fins are formed of long and slender rays. They are very fragile, and probably live in the depths, as they are usually more or less helpless when observed swimming near the surface of the sea. It is supposed that many sea-serpent (q.v.) stories are based upon inaccurate observation of these fishes, since they swim with an undulating movement, and their back is provided with a fin that extends along its whole length and commonly forms a crest on the head. Ribbon-fishes occur sporadically in all seas, and several species of the very dissimilar genera *Regalecus, Trachypterus,* and *Lophotes* are found at rare intervals on various portions of the Australian coast. The young are proportionately shorter than the adults, and have their fins greatly developed. *Regalecus glesne* is sometimes called 'king of the herrings.'

Several elongate fishes with silvery bodies—e.g. the frost-fishes (*Lepidopus*) and hair-tails (*Trichiurus*)—are commonly called ribbon-fishes, though they have no affinities with the Taeniosomi.

A.R.McC.

Rice. Baron von Mueller in his journey across northern Australia in 1855 discovered what he described as 'true wild rice.' This indicated that cultivated varieties should succeed, and it has since been proved that both swamp and upland rice of excellent quality can be produced in the tropical and temperate districts of Australia. Many attempts have been made to grow it as a commercial crop in Australia, both by individuals and at the state experiment farms. In 1869 A. J. Boyd grew several varieties of Japanese rice on his sugar plantation Omerau, Pimpama, Queensland, and distributed seed to other settlers. In 1898 the area under rice was 863 acres and averaged 14.19 bushels to the acre; in 1899 northern Queensland produced 14 per cent of the State's annual consumption, the Cairns district producing 82 per cent of the total yield. In 1900, however, the acreage had fallen to 319. This great decrease was attributed by Boyd to the fact that banana-growing, at that time, was more remunerative. In New South Wales trials are recorded in 1892, and again in 1911 with seed imported from the Central Provinces, India. In both cases the results were discouraging. A variety called 'Takasuka' was tried at Yanco in 1916-17, but unfortunately the crop was eaten down by locusts. In 1919 trials were made again at Yanco, this time with varieties imported from California. The chief difficulty experienced there was with weeds; under continuous irrigation proper cultivation was not possible. More recent trials on the Murrumbidgee irrigation area and at Coonamble have given better results. At Yanco in 1922-3 an experiment with 'Wataribune' gave more favourable results than those obtained with the same variety at the rice-experiment station at Crowley, U.S.A., a yield of 3223 lb. per acre being obtained as against 2727 at Crowley.

The essentials for success are:—a soil which is capable of holding moisture above the average, perfect grading of the land to almost dead level, and thorough command of water as required. The soil must never be allowed to dry out, but must, at the same time, be well drained. In preparing the land, the usual practice is to plough and leave it to aerate and sweeten, then to cross-plough and harrow to produce a fine tilth. Sow at the time of the first rains (in southern Queensland, in September or October), either broadcast (for fodder), in drills, or by transplanting. The rainfall required is from 20 to 30 inches during the period of growth. Harvesting is done with the ordinary sickle, or with wheat-harvesting machinery. In fact, the cultivation is much the same as in the case of wheat.

Encouraged by the success obtained on the government farms, several settlers planted small areas in 1923 ranging from 5 to 50 acres, with good results. Yields of up to 119 bushels were

obtained on the Murrumbidgee irrigation area, and up to 165 bushels at Coonamble. From a 20-acre paddock one settler had a gross return of £525. It is expected that in 1926 an area of 2000 acres will be planted in New South Wales.

Rice-growing should open up a new and important industry in Australia, as there is an extensive local market for it, and the crop is specially suited to the poorer land in the irrigation areas. Since the crop can be handled by machinery, the grower is not dependent on hand-labour to an unusual extent. At the Darwin botanic gardens numerous varieties have been tried; the opinion was formed that the upland or mountain variety could be planted, cultivated, and harvested in the Northern Territory in the same way as wheat, and that it would do as much for the Territory as wheat has done for South Australia. Great improvements might be effected both in the yield and in the quality of the grain if experiments were carried out similar to those which Farrer (q.v.) applied to wheat. In addition to its use as a food, rice is valuable on account of the excellent quality and high proportion (78 per cent) of the starch it contains, and it is preferred by starch manufacturers to wheat and other cereals and roots. The straw is used in the manufacture of straw-boards and paper. F.B.G.

Ricinocarpus, a genus of the family Euphorbiaceae, consisting of shrubs, frequently

R. pinifolius, and fruit-capsule.

clothed with star-like hairs and often very ornamental. Fourteen species are indigenous to Australia, ranging from east to west. *R. pinifolius* has large, white flowers and pine-like leaves; its large fruit-capsules, covered with rough bristles when ripe, explode violently, scattering the seeds. The seeds resemble those of the castor oil plant, and contain oil. *R. Bowmani,* a charming small tomentose shrub with pink flowers (there is a white-flowered variety) is found in the drier parts of New South Wales, and extends to central Queensland. The genus is well worthy of a place in gardens.

Ridley, JOHN (1806-1887), born near Hylton Castle in Durham county, England, on 26 May 1806, was educated at the village school and devoted himself at an early age to scientific experiments, constructing a workable electrical machine when only seven years old. A theological bent, however, led him at 18 to become a local preacher, and for 15 years he preached every Sunday. In 1839 he migrated to South Australia, taking with him a flour-mill worked by steam; this he set up at Hindmarsh, and by it was ground the first flour from the first South Australian harvest. He took up farming, and in the summer of 1842-3 was confronted with the problem of reaping and threshing an over-ripe crop when labour was very scarce. After consultation with neighbours in a similar plight, and especially with John Wrathall Bull (q.v.), Ridley constructed a 'locomotive thresher' with a horizontal projecting comb that stripped the wheat-ears from the standing straw, and revolving beaters driven by belts from the wheels of the machine; the machine itself was propelled from behind at the end of a long pole to which horses were harnessed. With this primitive 'stripper' several crops were gathered during the harvest of 1843-4; the operation was performed quickly, cheaply, and with the minimum of labour, and the full ripeness of the crops before gathering ensured the shipping of the grain to England in so dry a state that, despite the long voyage by sailing-ship, it arrived in excellent condition and topped the market. Ridley's stripper was not immediately popular, as the local farmers retained their English traditions, and preferred a machine that would cut the straw low down; but the hot, dry conditions prevalent at harvest time over the greater part of the wheat-area were so exactly suited by the stripper that it and its derivative the harvester gradually became the chief crop-reaping instruments in all fairly dry districts. Ridley did not patent his machine; he regarded it as his gift to the colony for the prosperity that had attended him there. According to his own account the first suggestion of it came to him from the description of a Roman invention in Loudon's *Encyclopaedia of Agriculture,* and he developed it without help or suggestion from any other source. In 1853 he returned to England and, after several years spent in travel, lived in comparative obscurity for the rest of his days. He invented a cinder-sifter and a straw-cutter which were exhibited in 1862 and in a few years were in practical use. Towards the end of his life he took up spiritualism. He died at Malvern, England, on 25 November 1887. A Ridley scholarship at the university of Adelaide commemorates his invention and its value to Australia.

See *A Backward Glance: the Story of John Ridley* (London, 1904).

Ridley, WILLIAM (1819-1878), born at Hartford End in Sussex on 14 September 1819 and educated at King's College, London (B.A., 1842), for a time studied law in London, but became interested in missionary work. The London

Missionary Society, however, rejected his application for employment, considering his theological views to approximate rather to those of the Plymouth Brethren. In 1849 he met Dr. Lang (q.v.) in London and accompanied him back to New South Wales, where on 3 April 1850 he was licensed to the ministry by the first Presbyterian 'Synod of New South Wales'—for which see PRESBYTERIAN CHURCH. He was ordained by Lang and appointed to Balmain, but in 1851 was transferred to Dungog and in 1852 to New England; this second transfer was due to his reviving interest in mission work, for in 1852-6 he devoted himself to unwearying travel among the aboriginal tribes of the region that lies between Liverpool Plains and the Darling Downs. He made a close study of their language, which he called 'Kamilaroi,' and in later years published several books on it (see ABORIGINAL LANGUAGES). In 1856 he moved to Victoria, and was for a short time minister at Portland Bay, but left this charge in 1858. In 1861 he returned to New South Wales, joining the Presbyterian Church of Eastern Australia (another branch of the Presbyterian community) and being listed as 'missionary within the bounds of the Presbytery of Sydney;' two years later he was listed simply as a minister with no settled charge.

From 1861 onwards he devoted himself to journalism and the study of aboriginal languages and customs. He was a frequent contributor to, and for some time assistant editor of, the revived Sydney *Empire*; in 1873-8 he was editor-in-chief of the *Evening News*. In 1866 he published *Kami'aroi, Dippil, and Turrubul*, and in 1875 *Kamilaroi and other Australian Languages*, which included also an account of aboriginal traditions and customs. He maintained, however, the connection with his Church, especially on the educational side, in 1868 helped to found St. Andrew's College within the university, in 1875 was appointed a theological tutor at the college, and the next year was chosen to examine candidates for the ministry. In 1877, the missionary spirit reviving in him, he took up the study of the Chinese language to fit himself for the superintendency of the mission to Sydney Chinese. He died on 26 September 1878.

J.V.C.-B.

Rifle-birds and Trumpet-bird, perching birds belonging to the family Paradiseidae (birds of paradise). This family of birds, unsurpassed for the singularity and beauty of their plumage, is peculiar to the Australian region; the great majority of the species are confined to New Guinea and the Papuan islands, a few occurring also in the Molucca Islands and four in north-eastern Australia. Three of these, known as rifle-birds, belong to the genus *Ptiloris*, and the fourth, known as trumpet-bird or manucode, is a member of the genus *Phonygammus*. Both these genera occur also in New Guinea. The male rifle-birds have velvety-black plumage, which in different lights appears rich purple, steel-blue, and coppery green; a patch of brilliant metallic feathers, burnished green and purple, is present on the throat. The females (and young males) are brown above and buff below, mottled, and barred with black. The bill is long, slender, and curved. Rifle-birds inhabit tropical scrubs and subtropical brushes, the Paradise Rifle-bird (*P. paradisea*) occurring in northern New South Wales and southern Queensland between Newcastle and Rockhampton; the Victoria Rifle-bird (*P. victoriae*) is a resident of northern Queensland, and the Albert Rifle-bird (*P. alberti*) of the Cape York Peninsula. They are lively, active birds, feeding on insects (for which their long beaks probe in the trees)

Victoria Rifle-bird (*length* 10 *in.*).

and uttering loud, unmusical calls. The males assume remarkable attitudes when displaying their brilliant plumage before the females. Their nests are built in tangles of climbing vines at some height from the ground, and are remarkable because they are almost always adorned with cast snake-skins. The eggs are flesh-coloured, boldly streaked (longitudinally) with reddish and purplish-brown.

Trumpet-bird or Manucode.
(*length* 11½ *in.*).

The Trumpet-bird (*Phonygammus gouldi*) derives its name from its loud notes. It is a shy bird, confined to the tropical scrubs of northern Queensland. The head, back, and breast are

green, and the wings, tail, and underparts purplish-black, while two long green feathers project backwards from the sides of the head. Its nest is placed in a fork near the end of a branch; the two eggs are purplish-pink, with longitudinal reddish and purplish stripes.

W.B.A.

Rignold, GEORGE (1839-1912), was born at Bristol in England in 1839. His family associations were entirely theatrical; his father was an actor-manager in a small way, his mother an actress of merit who had been associated with Macready and Phelps. Rignold was at first a violinist in the provincial theatre orchestras, and then drifted into acting at Birmingham, Bristol, and Bath. In 1864 he made his first appearance in London at the Olympic Theatre, under the direction of Tom Taylor, and made his reputation as Henry V—a rôle with which his name has ever since been associated. In 1875 he played the part to great applause in New York, and, fresh from this triumph, came to Australia, reaching Sydney in August 1876. On the 28th he opened in *Henry V* at the Theatre Royal. After touring Australia in 1877-8, he went back to London and repeated his success at Drury Lane. In 1883 he returned to Australia, and in 1887 settled in Sydney, becoming lessee of the newly-erected Her Majesty's Theatre; during the next decade he staged there a series of melodramas and Shakespearean productions whose like Australia had never seen before, and which have seldom been rivalled since, either in the merit of the acting or the beauty of the staging. Among the most important of the Shakespearean productions were *Hamlet, A Midsummer Night's Dream, The Merry Wives of Windsor,* and *Julius Caesar*; among the melodramas *In the Ranks, Youth, Lights o' London,* and *Called Back.* He also produced an original version of *Faust,* written for him by Gilbert Parker. He retired from the stage in 1900, but in 1902 journeyed to London to appear successfully at the Lyric Theatre in a benefit performance tendered to his brother William—a fine actor, who had also appeared in Australia under George's management. Rignold made his last public appearance at a benefit performance for G. S. Titheradge (q.v.), and died on 16 December 1912. See DRAMA.

S.E.N.

Riley, CHARLES OWEN LEAVER, born at Birmingham on 26 May 1854, and educated at Owens College, Manchester, and at the university of Cambridge (B.A., 1878; M.A., 1881), was ordained deacon in 1878 and priest in the following year, becoming curate of Brierley in Yorkshire (1878-80), of Holy Trinity, Bradford (1880-2), and at Lancaster (1882-5). In 1885-94 he was vicar of Preston, and in 1894 was elected bishop of Perth. On the establishment of the province of Western Australia in 1914 he was raised to the archbishopric. Since 1914 he has been senior chaplain-general of the Commonwealth military forces. In 1916 he was elected chancellor of the university of Western Australia, and in 1920 became president of the public library, museum, and art gallery of Western Australia.

J.S.B.

Ringbarking. In some cases a broad strip of bark is taken off right round the trunk; in others the axe is simply driven through the bark and into the layer of wood immediately behind it. Tens of thousands of square miles in Australia have been ringbarked with the object of encouraging the growth of grass; but sometimes the result has been a growth of 'suckers' and saplings, of scrub and rubbish, that made the last state of the land worse than the first. Called 'girdling' in the United States, it has been practised from time immemorial by the Indians of the Atlantic coast, and still is in some of the States, though not to anything like the extent to which it is in Australia. In the early days of settlement its use in Australia was confined to land that was being cleared for cultivation, and even then only to a limited extent. Atkinson's *State of Agriculture and Grazing in New South Wales* (London, 1826), says that in clearing land, some ringbarked the trees; others cut them down and then ringbarked the stumps close to the ground, presumably to keep them from sending up shoots. In describing a visit paid in 1839 to the property of the Australian Agricultural Company (q.v.) near Port Stephens Captain J. L. Stokes mentions that one of the experiments in the clearing of land near Stroud was that of ringing the trees. It was not till about 1860, however, that ringbarking was practised on a large scale. In or about that year Thomas Hungerford adopted it on his property in the Hunter River district. His example was followed by the Whites, and by 1870 ringbarking was general in that part of New South Wales. The Ringbarking Act which was passed by the New South Wales parliament in 1881 prohibited it on crown leases without the consent of the minister, the penalty ranging from 1s. to 10s. for each tree. Later legislation provided that permits should be subject to a provision that a certain number of trees be left to the acre. Ringbarking on private property is not subject to restrictions, and permits to turn crown leases into 'Skeleton Flats' were for many years freely granted. As a result the timber on a very considerable portion of the total area of Australia, especially in New South Wales, southern Queensland, Victoria, and Tasmania has been destroyed.

T.D.

Ring-tails. See OPOSSUMS.

Rintel, MOSES (1823-1880), born in Edinburgh in 1823, was educated by his father Myer Rintel, a distinguished Hebrew and Talmudic scholar, and was for some years reader to the Brighton synagogue. Having received ordination from Solomon Herschell, chief rabbi in London, he migrated in 1844 to Sydney, where a synagogue had recently been opened (see JEWS). In 1849 he became minister of the Melbourne Hebrew congregation, but resigned this charge in 1857 to form the Mikveh Israel congregation, the predecessor of the present East Melbourne synagogue. In 1864 he helped to establish a duly constituted Beth Din—the only British one then established out of London—of which he became chairman. He was a steadfast upholder of orthodox Judaism, philanthropic, and widely esteemed. He died on 9 May 1880.

Riou, EDWARD (1758?-1801), entered the British navy early in life (lieutenant, 1780; commander, 1790; captain, 1791). He is interesting to Australians for his association with Captain Cook's third and last voyage, and on account of his commanding H.M.S. *Guardian,* which was lost when voyaging to New South Wales with stores and provisions. After some years' service at Portsmouth and on the Newfoundland station, Riou joined the *Discovery* as

a midshipman, and followed his captain, Clerke, to the *Resolution* after Cook's death at Hawaii.

Riou was upwards of 22 when, in 1780, he secured his lieutenancy. After some time spent on active service, he was appointed in April 1789 to the command of the *Guardian*, which sailed in the following autumn for Sydney with stores and agricultural implements, and with instructions to ship cattle at the Cape of Good Hope. With the exception of 12 cannon all the *Guardian's* guns were sent ashore and a cabin was fitted up on deck for the reception of trees and plants selected by Sir Joseph Banks; with the cattle shipped at the Cape, the value of the cargo was estimated at £70,000. On 24 December, 12 days out from Cape Town, in lat. 44° S. and long. 41° E., the *Guardian* fell in with a large iceberg, from which Riou made an attempt to replenish his water-casks. The boats were hoisted out, and the casks were filled, but the iceberg took the ship's wind, the breeze being too light for her to gain headway. The base of the berg projected under the surface of the sea; against this the *Guardian's* bow struck, and on getting clear she appeared to be sinking. Then she swung round and, her stern striking violently, the rudder broke adrift, and she became almost a total wreck with six feet of water in her hold. All hands laboured at the pumps, but the water gained with every hour, and although every movable object had been jettisoned, she seemed to be doomed. On Christmas Day Riou went to his cabin and wrote the following to the secretary of the admiralty:—

> If any part of the officers or crew of the Guardian should ever survive to get home, I have only to say their conduct after the fatal stroke against an island of ice was admirable and wonderful in everything that related to their duties considered either as private men or on His Majesty's Service. As there seems to be no possibility of my remaining many hours in this world, I beg leave to recommend to the consideration of the Admiralty, a sister, who, if my conduct or services should be found deserving any memory, their favours might be shown to her, together with a widowed mother.

Having written this, he sent the ship's five boats away with about 70 of the crew; himself, the boatswain, the carpenter, a midshipman, and the remainder of the ship's company stood by the vessel. None of the boats were ever heard of except the launch, which, with nine survivors, was picked up ten days afterwards by a French merchant ship. Among the survivors was John Crowther, who was on his way to fill the post of assistant chaplain at the settlement, with a salary of 8s. per diem; but after this experience he returned to England. The Cape was distant more than 400 leagues, and the *Guardian's* position was one of the greatest danger, not only from her crazy condition and the tempestuous state of the weather, but from the menacing temper of the convicts. Some of them, however, remained loyal and were subsequently rewarded, at Riou's request, by conditional enlargement. Although the rudder was gone, and the intake of water reached to the orlop deck, the commander's courage, seamanship, and tact won through. After a voyage almost without parallel, the vessel made the Cape on 21 February 1790, and was towed into Table Bay by a Dutch packet. She was immediately taken into False Bay for repair, but one of the hurricanes common to that quarter drove her ashore, a total wreck.

Riou served with Sir John Jervis in the operations of 1794 against Martinique and Guadeloupe; as captain of the *Amazon*, a frigate of 38 guns, he was attached to the Baltic fleet, and on 31 March 1801 took the commander-in-chief, Sir Hyde Parker, and Lord Nelson to reconnoitre the defences of Copenhagen. In the battle of the following day he led a detached squadron, consisting of the *Amazon*, *Blanche*, *Alcmène*, *Arrow*, and *Dart*, with two fire-ships, through the narrow Upper Channel 'to co-operate in the attack upon the ships stationed at the harbour's mouth, and to act otherwise as circumstances might require.' The *Amazon* was so hotly engaged that she became enveloped in smoke, and Riou gave the order to cease firing —a fatal order, for the Danes, getting a fair sight of his ship, poured in a tremendous fire on her from the batteries. In the account given by Southey, Riou is reported to have said, 'What will Nelson think of us!' as he unwillingly drew off. He had been wounded in the head by a splinter, and was sitting on a gun encouraging his men, when, just as the *Amazon* showed her stern to the Trekroner battery, his clerk was killed by his side, and another shot swept away several marines who were hauling in the main brace. 'Come then, my boys,' cried Riou, 'let us die all together.' The words had scarcely been uttered before a raking shot cut him in two. Unless it had been of Nelson himself, the British navy could not have suffered a severer loss. He was distinguished for great gallantry, and a humanity exceptional in his epoch. Captain Brenton, the naval historian, called him 'a perfect officer;' and Lord Nelson lamented his early death, writing in a despatch:—'In poor dear Riou the country has sustained an irreparable loss.' Campbell commemorated his fame in the last stanza of his ballad 'The Battle of the Baltic,' parliament voted him a monument in St. Paul's, and his renown penetrated even the merchant service, a well-known chantey having for refrain the words, 'Riou was a gallant man; heigh-ho, Riou!' F.J.Br.

Robe, Frederick Holt (1800-1871), fourth son of Sir William Robe who was one of Wellington's best artillery officers in the Peninsular war, was born in England in 1800 and (like all his brothers) trained for a military career. He joined the army in 1817 (lieutenant, 1825; captain, 1833; major, 1841; lieutenant-colonel, 1847; colonel, 1854; major-general, 1862), served in the Syrian campaign of 1840-1, and was for several years military secretary to Major-general Nicolay at the Mauritius and in Gibraltar. When in 1845 it became urgently necessary to send the then governor of South Australia, George Grey (q.v.), to take charge of affairs in New Zealand, Robe—a bachelor, and already stationed some way along the route to Australia—was hurriedly despatched to take his place, the *Elphinstone*, which carried him to Adelaide, having instructions to pick up Grey there and take him direct to his new sphere of work. Robe reached Adelaide on 14 October 1845 and was sworn in as lieutenant-governor on the 25th; thus he did not formally supersede Grey, but the governorship fell into abeyance, and was not revived until 1855. Being a Tory of the old school, with a military training to boot, Robe ruled with an iron hand, and his overbearing manner brought him into repeated conflicts with the public and with the legislative council. In June 1846 he introduced into the council the question of state aid to religion, declaring that the colony was in this respect the most backward in the Empire. Although

his proposed ordinance was strictly non-sectarian (it purported 'to promote the building of churches and chapels for Christian worship, and to provide for the maintenance of ministers of the Christian religion'), the colonists held indignation meetings and presented petitions against the measure; when a deputation of leading citizens waited on the governor with a memorial, he said 'I have no remarks to make,' and bowed them out. In the end Robe and three government nominees voted for the ordinance, four elected members against it, and Robe's casting vote made it law. (In 1851, when the council became two-thirds elective, the ordinance was repealed.) Robe also tried—following the instructions of the colonial office—to impose a royalty on minerals, but the elected members walked out of the council-room and left him without a quorum; another tax which he tried to impose was cancelled by a decision of the supreme court. He felt ill at ease in this hostile atmosphere, and as early as 1846 applied for transfer to some other post. In 1847 he was appointed deputy-quartermaster-general at the Mauritius, but could not leave South Australia until 2 August 1848, when his successor Sir Henry Young arrived. His subsequent career was uneventful. He died in London on 4 April 1871. (C.B., 1848.)

Roberts, TOM, born at Dorchester in England on 9 March 1856, arrived in Melbourne at the age of 13, studied at the national art school there, and went back to England to attend classes at the Royal Academy school. After a sketching tour in France and Spain, he returned to Melbourne in 1885 and taught impressionism to Streeton and Conder (see ART). He was one of the first to paint out-back subjects—e.g. 'The Golden Fleece,' 'A Mountain Muster,' 'Shearing the Rams,' and 'The Break-away,' his finest example. He exhibited with the Victorian Artists' Society and the Royal Art Society, and was the first president of the Sydney Society of Artists founded in 1895. Among his portraits are those of Sir Henry Parkes (in the Sydney gallery), Lord Beauchamp, and Lord Hampden (at government house, Sydney), Edward Ogilvie, Professor Laurie of Melbourne, Dr. Paton, General Hutton, and Lord Tennyson. His well-known 'The State, The Church, and The Law' includes Sir Henry Parkes, Cardinal Moran, and Judge Windeyer. In 1901 he went to London to complete 'The Opening of the First Commonwealth Parliament' (which now hangs in St. James's Palace), and exhibited at the Academy and the Old Salon. Throughout the war of 1914-18 he served with the Royal Australian Medical Corps at the Wandsworth military hospital. He is represented in the Sydney, Melbourne, and Adelaide galleries, and in the Commonwealth collection. W.M.

Robertson, GEORGE (1825-1898), born in Scotland (probably at Glasgow, where his father was a city missionary) and apprenticed to a Dublin bookseller, James McGlashan, in 1852 migrated to Victoria and established a bookselling business in Russell-street, Melbourne. As business expanded, he opened branches in Sydney, Brisbane, Adelaide, and Auckland. In 1883 a limited company took over the business, Robertson being managing director and David Syme (q.v.) a director; but in 1887 Robertson bought out all the shareholders and resumed entire control. In 1890 he retired, and died in Melbourne on 23 March 1898.

Trained in Dublin at a time when communication with London was much slower than it now is, he had learned to 'think ahead'—to provide for the needs of three or four weeks hence. In Russell-street he had to think four or five months ahead—a difference in degree which he soon mastered. If, as statistics show, Australians and New Zealanders buy more books in proportion to population than any other people in the world, the credit lies mainly with George Robertson, whose foresight provided at every likely centre a supply in advance of the demand.

Robertson, SIR JOHN (1816-1891), born at Bow near London on 15 October 1816, brought by his parents to New South Wales in 1820, and educated under Dr. Lang, Dr. Gilchrist, and W. T. Cape, in 1833 embarked as a sailor aboard the trader *Sovereign*, left her when she reached London, and travelled in Scotland, Ireland, France, and South America. His father was a friend of Governor Brisbane, and young John, when he returned to Australia in 1835, brought back letters of recommendation from Lord Palmerston to Governor Bourke, so that he did not lack patrons. In 1835 he occupied a run on the Liverpool Plains outside the 'bounds of settlement,' thus becoming technically a trespasser (see LAND LEGISLATION), and took an active part in the campaign which secured to him and his fellow-'squatters' the right to use waste lands for grazing; when, however, his friend W. C. Wentworth formed a Pastoral Association that demanded the freehold of their runs, Robertson severed himself from the movement and remained outside politics, devoting himself to the management of the family estates on the upper Hunter, and gaining a reputation as a man of strong 'radical' opinions who wrote frequently to the press but rarely visited Sydney. In 1855 he gave evidence before a committee on the state of agriculture in the colony; his evidence, which is of great historical interest, is fully given in Henry Parkes's *Fifty Years of Australian History*, vol. i, pp. 73-90. Leaping at once into political prominence, he was returned in April 1856 to the legislative assembly, in which he sat successively for Phillip, Brisbane, and Bligh (1856-9), the Upper Hunter (1859-61), the Shoalhaven (1862-4), West Sydney (1864-6), the Clarence (1866-9), West Sydney again (1869-77), and Mudgee (1877-8 and 1882-6). Twice—for six months in 1861, and in 1878-81—he was a member of the legislative council.

When he entered parliament in 1856 he advocated manhood suffrage, voting by ballot, equal distribution of seats, a national system of education, and free selection of land. His first work was to amend Murray's land bill, bringing about a dissolution over the issue. In January 1858 he became secretary for lands and public works in the Cowper administration, dealt promptly with outstanding applications for land, and introduced a land bill which lapsed owing to a dissolution. In 1860 he brought down important amendments to the Forster ministry's land bill, and on the defeat of that ministry formed one of his own (on 9 March); but, the land question being at the moment his sole preoccupation (see LAND LEGISLATION), he at the beginning of 1861 resigned the premiership to his colleague Charles Cowper and devoted his entire attention to his bill. It passed the assembly, but was rejected in the council, whereupon Robertson resigned his assembly seat, was nominated to the council, and amid fierce fight-

ing secured the passage of the bill there. In the Cowper ministry of 1865-6 he was again secretary for lands, but resigned in October 1865. By this time the rivalry between James Martin and Charles Cowper was being paralleled by that of Henry Parkes and John Robertson, and until 1878 the political history of New South Wales is mainly a record of their duels—in 1877, for instance, Robertson was premier until 21 March, Parkes thence until 16 August, and then Robertson again until 17 December; then a stop-gap ministry under J. S. Farnell gave the opponents breathing-space and an opportunity to coalesce —which they did in December 1878.

After 1865 Robertson's political career was strenuous, but the results were not of great permanent value. In 1866, while in opposition, he aided Parkes to carry a public schools act. In 1868 he formed his second ministry, but grew tired of endless quarrels in the legislature, and in January 1870 resigned the premiership again to Cowper, taking the lands department from August to December; then, to the surprise of his friends, he joined James Martin—who had quarrelled with Parkes—as colonial secretary from December 1870 to May 1872. During the Parkes ministry of 1872-5 he led a fighting opposition, and drove Parkes from office because of the pardon granted to Frank Gardiner (q.v.). In forming his third ministry (1875-7) he introduced to office Alexander Stuart and William Bede Dalley. But the public began to demand less fighting and more legislation, and at the end of 1877 both Parkes and Robertson failed to gain a majority at the elections—a hint which, as has already been said, they took to the extent of forming a coalition. When Farnell was defeated in December the following year Parkes took the premiership, Robertson acting for him during an illness that lasted from December 1881 to August 1882; Robertson, who had resigned his seat in the assembly, represented the government in the council, and after the passing of Parkes's education act became minister of public instruction. Resigning this office in November 1881, he returned to his old favourite the lands department, but his proposals for land legislation wrecked the ministry in January 1883. After two years in opposition he again took office in December 1885, but was compelled by ill-health to retire from active politics in the following February, receiving for past services a grant of £10,000. When federation became a burning question, he emerged from his retirement and fought vehemently against it, leading what was contemptuously known as the 'geebung' party; federation, he declared, was merely a 'fad' of Parkes's, Victoria a 'cabbage-garden' and not worth trading with—but his real objection was that he feared federation as the first step to severance from the Empire. He died at Watson's Bay near Sydney on 8 May 1891.

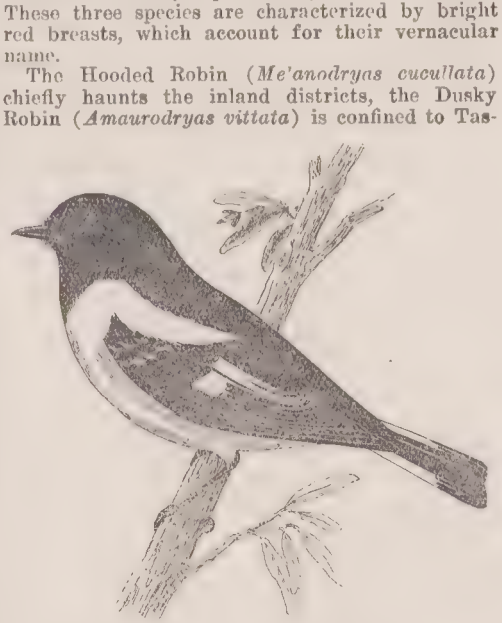
Robertson's character, especially that side of it which made him a dominant influence in his colony, is difficult to describe; 'it is as hard,' wrote B. R. Wise (q.v.), a strong opponent of his on the federation question, 'to convey a true impression to a later generation as it was for a contemporary who had not come under the spell of the enchanter, to appreciate the adoration of his friends. . . His long experience of affairs and keen insight into character made him the political oracle of a large circle, and his chivalrous loyalty attached with the closest ties all who came under his influence. His presence was strikingly handsome—the features clear-cut, flowing white hair and agile figure—while a natural gift of profanity and an uncompromising directness of speech, expressed in husky tones (he had no palate), have enriched our annals with many pleasant anecdotes.' (K.C.M.G., 1877.)

Robins. This name is in Australia applied to a group of small perching birds, usually with brightly coloured breasts, belonging to genera that are peculiar to the Australian region. These genera (the largest of which are *Petroica* and *Eopsaltria*) appear to be closely related, and form a connecting link between flycatchers (Muscicapidae) and thickheads (Pachycephalidae), though some authorities consider them akin to chats (Saxicolidae). They have no special connection with the robins of other parts of the world, which are of the thrush (Turdidae) or warbler (Sylviidae) families.

Australian robins all build open cup-shaped nests of bark, grass, and fibres, usually ornamented outside with lichens, and placed near the ground upon a rock or tree-trunk, or in the fork of a branch at no great height. They are useful, as their food consists almost entirely of insects. Many of them are tame and confiding, and their sprightly actions and bright colours make them favourites with lovers of nature. Their notes are usually pleasing, though they do not take high rank as songsters.

The Scarlet-breasted Robin (*Petroica multicolor*) is a common inhabitant of open forest country in southern Australia and Tasmania; the Red-capped Robin (*P. goodenovi*) takes its place in the interior of the continent. In south-eastern Australia and Tasmania the Flame-breasted Robin (*P. phoenicea*) is also familiar. These three species are characterized by bright red breasts, which account for their vernacular name.

The Hooded Robin (*Melanodryas cucullata*) chiefly haunts the inland districts, the Dusky Robin (*Amaurodryas vittata*) is confined to Tas-



Hooded Robin (*length* 6½ *in.*)

mania, and the White-breasted Robin (*Quoyornis georgianus*) is peculiar to south-western Australia. These birds are perhaps the best-known of a number of dull-coloured forms rather larger than the red-breasted species.

Another common and familiar bird is the Yellow-breasted Robin (*Eopsaltria australis*) of eastern Australia, a still larger species with bright yellow coloration that makes it conspicu-

ous. In South and Western Australia a similar bird, the Gray-breasted Robin (*E. griseicapilla*), is equally common and familiar. In this species

Yellow-breasted Robin (*length 5 in.*).

the gray coloration of the throat extends down to the breast, but most of its underparts are, as in the eastern form, bright yellow. These yellow-breasted robins have a curious and characteristic habit of perching sideways on the rough bark of a tree-trunk.

Scrub-robins are not related to the other Australian robins, but are allies of the ground-birds (q.v.).

W.B.A.

Robinson, GEORGE AUGUSTUS, of whose early life we know only that he was a Methodist, in 1824 migrated to Hobart and worked as a bricklayer and builder. Ardently pious, he became the secretary of the Bethel Union for work among sailors in the port, and so came in contact with tame aboriginals who hung about the wharves; their plight, and the worse plight of the inland tribes with whom the settlers at that time waged a perpetual war, excited his active interest, and in 1829 he was placed by Governor Arthur in charge of a small aboriginal station on Bruni Island. Here he studied the natives' language and gained an ascendancy over the refugees under his charge, and from among them picked assistants for the work which made him famous. When the Black War (see TASMANIA) failed to round up the tribes, and the parties under Batman, Jorgensen, and their fellows were almost equally unsuccessful, Robinson offered to go out unarmed and persuade the alarmed and hostile tribes to come in peacefully. Experienced men thought the proposal absurd, and exasperated settlers declared it highly dangerous; but Robinson, securing permission from the governor, set out with his native assistants—one of whom, Trucanini (q.v.), lived to be the last pure-blooded Tasmanian aboriginal—and one or two white men. In his first expedition he walked, carrying a little oatmeal as food, from Hobart to Port Davey and then northward along the west coast through a barren, difficult country, much of which is even now little known and hardly ever traversed. In 1831 he brought in 54 aboriginals, in 1832 63, in 1833 42, and in 1834 28—187 in all. It was supposed at the time that the members of the Stony Creek tribe, his last capture, were the last natives at large, but in 1842 a sealer brought in a family of six from Cape Grim.

The aborigines were placed on Flinders Island in Bass Strait, and in 1835 put under Robinson's charge; but in this capacity he had no great success. In 1838 he was appointed by the colonial office protector of aborigines in Victoria, and had some notion of taking the Tasmanian aborigines over to the mainland, but nothing came of it. Qualities which had enabled him to win the confidence of savages were not of the same value in his new position. Gipps thought him inactive and 'afflicted with a love of writing,' and Latrobe found him hard to get on with. In 1849 his office was abolished; in 1853 he returned to England, settled at Bath, and died there on 18 October 1866.

Robinson was a compiler of verbose reports, and masses of his writings are preserved in the Tasmanian records. Unfortunately, in spite of his unrivalled opportunities, he left little of scientific value, and even the Tasmanian vocabulary which in 1864 he was arranging for publication never saw the light. He dabbled in verse, but it is of poor quality.

T.D.

Robinson, SIR HERCULES. See ROSMEAD, LORD.

Robinson, MICHAEL MASSEY (1747-1826), born in 1747 and educated at the university of Oxford, practised for many years as an attorney before he betook himself to verse-making and blackmail. One of his poems revived a disproved charge of murder against James Oldham Oldham, whom some authorities describe as a London ironmonger and others as a respectable magistrate and 'deputy-judge-advocate-general' of England. For attempting to blackmail Oldham by a threat to publish this poem Robinson was in 1796 sentenced to death, but at the prosecutor's request was reprieved and transported to New South Wales. He reached Sydney in the *Barwell* on 18 May 1798. Travelling by the same vessel was Richard Dore, judge-advocate of the colony, and a sick man at the time; Robinson made himself useful to Dore, and was rewarded with a clerkship in the judge-advocate's office and a conditional pardon a fortnight after landing. In September 1802, however, he was found guilty of perjury and sentenced to seven years on Norfolk Island. The sentence was suspended at the request of the new judge-advocate, Richard Atkins, but the culprit was soon afterwards convicted of forging permits, and on this occasion sentenced 'never to interfere in any circumstances respecting law transactions either in private or in public.' This ended his career under Atkins, and in 1804 he frequently advertised in the *Sydney Gazette* that he was acting as agent for various settlers. In July 1805 Governor King—who suspected Robinson of sending complaints about his administration to England—procured from a bench of magistrates (of whom Atkins was one) the opinion that 'it would conduce to the peace and happiness of this part of the colony' if the poet were sent to some other part; in August, therefore, he was sent to Norfolk Island; Piper (q.v.) was recalled and severely rebuked by Bligh for letting him return to Sydney in 1806. On 1 April 1810 Macquarie appointed him first clerk in the government secretary's office, and his troubles were over. He held that position until July 1819, was then made deputy-provost-marshal, in May 1821 was transferred to the police department as principal clerk, and died on 22 December 1826.

From 1810 to 1821 he recited an ode of his own composition at each official levee held to celebrate the birthday of King George III (4 June) or Queen Charlotte (18 January). In 1818 and 1819 he was granted two cows from

the government herd 'for his services as Poet Laureat.'

In style these odes conform exactly to the accepted eighteeth-century conventions, and are full of abstract nouns and capital letters; that written for the King's birthday in 1810 is typical in this respect:—

> See PITY move, with melting Eye,
> Led by her Sister, CHARITY.
> Next INDUSTRY, with sturdy Stride,
> And PERSEVERANCE by his side.
> Then comes RELIGION, heav'n-born Child!
> With Look divine, and Accent mild:
> Whilst REFORMATION'S sober Mien
> Sustained by GRATITUDE is seen;
> And HOPE, with Hand extended, smiling free
> Points out the Path to bright PROSPERITY!

But the matter is worth study as illustrating both the vagaries of Georgian loyalty and the events of the time. The importance given to the personality of the Queen is remarkable; an ode of 1815 celebrates

> THE PROUD PRE-EMINENCE OF CHARLOTTE'S NAME,

a phrase far more reverential than any allotted to the King. The royal family title, Brunswick, is unexpectedly prominent throughout the series. Robinson does his best to give the Cam and the Isis equal honour, but betrays his preference for Oxford by repeatedly dragging in King Alfred—which suggests that he had been at University College. Apart from these and similar generalities the odes more or less date themselves by their references to the affairs of the year. The June ode of 1810 celebrates Macquarie's reform of the female orphan institution:—

> For ever be the Hands rever'd
> That yon blest Sanctuary rear'd:
> That bade the little Wanderers come
> And find a shelt'ring, happy home:
> That with maternal Fondness chas'd their Tears
> And snatch'd from Scenes impure their op'ning Years.

The odes of 1811 praised Macquarie's treatment of the aborigines and the bells of St. Philip's church; those of 1812 lamented the illness of George III and waxed ecstatic over the taking of Mangalore; in 1813 the King's illness recurs, but the main theme is Wellington's victories in the Peninsula; 1814 had no special themes—merely the greatness of 'Albion,' where there were 'no fraudful conscripts;' in 1815 the defeat of Napoleon and the return of the Bourbons to a peaceful and happy France were described, and in 1816 the victory of Waterloo (news travelled slowly from Europe, and Robinson was always about a year late). In 1816, however, there was something of local interest to talk about; Macquarie had crossed the mountains and founded Bathurst, and so the Queen's birthday ode told how

> ...Yon Blue Mountains, with tremendous Brow,
> Frown on the humbler Vales that wind below,
> Where scarcely human Footsteps ever trac'd
> The craggy Cliffs that guard the lingering Waste.

In January 1817 the marriage of the Princess Charlotte was the main theme, but in June Macquarie figured largely—his schools, his orphan institution, his new hospital:—

> To form those Schools that train thy Youth
> To Paths of Piety and Truth;
> To aid that Refuge Pity spread
> To shield the houseless Orphan's Head;
> To rear yon Fabric, that with stately Boast,
> Shews its white Columns to the distant Coast;
> Within whose Walls pale Sickness rears its Head,
> Fresh, with calm Slumbers, from the cleanly Bed.

In the January ode of 1818 the numerous references to Mercy as tempering Justice are probably a guarded allusion to Macquarie's emancipist policy. The June ode is taken up with the death of Princess Charlotte; that of January 1819, after a lament for the Queen's illness (Robinson did not then know that she had died in the previous year), recurs to Macquarie's achievements, especially the South Head lighthouse:—

> And yon tall Tow'r, that with aspiring Steep,
> Rears its proud Summit o'er the trackless Deep;—
> —The recent Care of His Paternal Hand
> That long has cherish'd this improving Land;—
> Thro' the drear Perils of the starless Night
> Shall shed the lustre of revolving Light.

(The cows that rewarded the poet in 1818 and 1819 are now sufficiently accounted for.)

In June 1819 Macquarie's aboriginal school was applauded because it

> Shelters with pious Care the houseless Child,—
> The lorn Inheritor of Woodlands wild.

But the June (and only) ode for 1820 drops Macquarie—with Bigge about, laudation of the governor might have been injudicious—and reverts to Britain, where the agitations that culminated in the 'Peterloo' riots did not meet with Robinson's approval:—

> Shall Faction's dark and lurking Band
> With daemon Howl disturb the Land;
> And, stealing from their noxious Cell,
> Raise Anarchy's discordant Yell?

The last effusion, that for the birthday of George IV—13 August 1821—is mainly a *rechauffée* of phrases from many previous odes, in which Athens and Virgil and Albion and Shakespeare and Milton are strung round the new king,

> Whose bright Career, from opening Youth,
> Left the fond Pledge of FILIAL TRUTH;—

but, Bigge having departed, Robinson was free again to sympathize with Macquarie's doubts about the nature of the commissioner's report:—

> Tho' startled Hope, with anxious Eye,
> And trembling Fear, with boding Sigh,
> In chilling Sympathies await,
> The Fiat of impending Fate.—

The *envoi* rings sincerely:—

> REMEMBRANCE, LONG, TO PRIVATE WORTH ENDEAR'D,
> SHALL HAIL THE FRIEND BELOV'D—THE CHIEF REVER'D!

On 29 December Robinson advertised in the *Gazette* a forthcoming volume to contain all the 21 odes with a portrait of the author from a painting by Robert Read; everything—poetry, painting, printing, and engraving—was to be colonial work, and the price £1. But subscribers must have been lacking, for no more is heard of the book. Fortunately the Dixson collection contains the originals of 20 of the odes; the 21st was printed in the *Sydney Gazette* of 18 August 1821.

Robinson, SIR WILLIAM CLEAVER FRANCIS (1834-1897), brother of Sir Hercules Robinson (see ROSMEAD, BARON), was born on 14 January 1834 at Rosmead in Westmeath county, Ireland, and in 1855 became his brother's private secretary at St. Kitts, and went with him to Hong Kong in 1859. In 1862 he obtained independent office as president of Montserrat, and embarked on a career under the colonial office during which he was successively administrator of Dominica (1865) and governor of the Falkland Islands (1866), Prince Edward's Island (1870), and Western Australia (1874). In 1877 he succeeded Sir W. F. Jervois as governor of the

Straits Settlements, but in 1880 returned to Western Australia; during this term he succeeded in placing the colony's finances on a sound footing. In 1883 he was transferred to South Australia, again in succession to Sir W. F. Jervois: his term of office in this colony was marked by important railway developments. In 1889 he left South Australia, administered for nearly eight months the government of Victoria, and returned to England at the end of the year. In 1890 he rendered great service both to the colonial office and to Western Australia during the passage through the British parliament of the bill conferring responsible government on that colony, and in October was for a third time made governor of it; having successfully initiated the new system—not an easy task in a crown colony of long standing—he left the colony finally in March 1895, and died in London on 2 May 1897. (C.M.G., 1873; K.C.M.G., 1877; G.C.M.G., 1887.) J.S.B.

Rock Blackfish. See DRUMMER.

Rock Cod, a vernacular name applied to several fishes that have little or no affinity with the true cod (*Gadus*) and differ widely from one another. The Black Rock Cod (*Epinephelus dameli*) of New South Wales waters is typical of a large genus, of which many species are variously known as 'cod' or 'groper' in Australia, and as 'hind' or 'grouper' in America. They belong to the large percoid family Serranidae, and a number are recorded from our waters. They lie in wait among rocks and reefs, ready to rush out and engulf their prey in their large mouths. Many are brightly coloured with reds, yellows, and blues, combined in patterns that alter in intensity as the fish becomes passive or excited. The Coral Cod (*E. fuscoguttatus*) and the Black-spotted Rock Cod (*E. tauvina*) of Queensland reefs are prized in the northern market, together with many others of the same genus. The Giant Cod or Queensland Groper (*Promicrops lanceolatus*) is known from the estuaries of Queensland and northern New South Wales, but probably occurs on most of our tropical coasts. It attains a length of six feet and a weight of 300 pounds. Allied species of similar size, lurking in holes in coral-reefs, are dreaded by native divers because of their habit of rushing out to seize moving objects.

The Scarlet Rock Cod (*Colpognathus dentex*) of South and Western Australia is a gorgeous fish, with blue spots and yellow markings on a scarlet ground-colour. It reaches a large size, and is excellent eating. This species has also been called the harlequin fish. See RED ROCK COD. A.R.McC.

Rock-wallabies, two genera (*Petrogale*, containing at least eight species, and *Peradorcas*, containing but one species) of the marsupial family Macropodidae, differing from ordinary kangaroos and wallabies in having (among other points) the long tail tapering, and ornamented at the end with a tuft or pencil of long hairs. The most widely-distributed species is the Brush-tailed Rock-wallaby (*Petrogale penicillata*), which occurs in the coastal districts of New South Wales, Victoria, and Queensland. It is a rather large wallaby, the head and body together being about 29 inches, and the tail about 23 inches. The fur is long, thick, and coarse, dull brown above, lighter underneath, with black fingers and toes; the tail is black throughout most of its length, though sometimes yellowish at the tip. Rock-wallabies frequent the roughest country and, owing to their expertness in leaping from rock to rock, are usually able to elude capture by dogs or dingoes. At night they come out of their lairs in caves or clefts to feed, retiring about dawn, and are rarely seen abroad during the day-time. The Yellow-footed Rock-Wallaby (*P. xanthopus*), which is confined to South Australia, is remarkable for the brilliancy of its colouring and the conspicuousness of its markings. Its general colour is a pale reddish-brown mixed with gray, the head and limbs being ornamented with orange, yellow, white, and black

Brush-tailed Rock-wallaby.

marks, and the tail with alternating rings of brown and yellow; a species (*P. celeris*) closely related to *xanthopus* has recently been described, from the vicinity of the Bulloo River, south-western Queensland, which has a less brilliant colouring and the tail less definitely ringed. Another recently described species (*P. purpureicollis*), from the Dajarra district in north-western Queensland, is similar to *penicillata* in form but differs in the coloration, which is very variable, and though the back of the neck is purplish in life, the colour quickly fades after skinning. The West Australian Rock-wallaby (*P. lateralis*) has a well-marked white stripe running along the side from behind the elbow to the hip; the tail is gray in the front half, black behind.

Other species are the Short-eared Rock-wallaby (*P. brachyotis*) which has shoulder-markings, and the Little Rock-wallaby (*Peradorcas concinna*) without shoulder-markings, both from north-western Australia. Another species (*Petrogale inornata*), lacking shoulder-markings, has been recorded from the 'north coast of Australia,' the type of which is not traceable; it is distinguished from *concinna* by its larger size, its foot without the claw measuring about 5 inches as opposed to 4 in *concinna*.

Two insular species of *Petrogale* have been described comparatively recently—*hacketti* in 1905 from Mondrain Island, Recherche Archipelago, south-western Australia, and *pearsoni* in 1922 from Pearson's Isles, Investigator group, South Australia. See MARSUPIALS. W.A.H.

Rock Whiting. See PARROT-FISHES.

Rodents, mammals of the order Rodentia, which, though much inferior in numbers and importance to the marsupials, yet constitutes a large element in the indigenous Australian fauna. Altogether more than 50 species have been described, all belonging to a single family, Muridae, and many to the genus *Rattus*, to which the two common world-wide rats belong; the rest, differing from these in certain points, are placed in special genera, most of which are not known to be represented outside the Australian region.

Of *Rattus* itself no fewer than 19 endemic species have been described, and 18 of the allied but smaller genus *Pseudomys* (field-mice). These rats and mice range in length of head and body between 2½ and 8¼ inches. In habits and mode of life they differ considerably; some frequent open plains, others forest or jungle; one or more species are essentially water-rats, burrowing in the banks of streams; others live habitually in trees, and make nests among the branches and in hollows in the trunks and limbs.

Of the large water-rats (*Hydromys*), peculiar to the Commonwealth and to Papua, there are four Australian species, the best-known being the Eastern Water-rat (*H. chrysogaster*) of eastern Australia and Tasmania and the Western Water-rat (*H. fuliginosus*) of south-western Australia; both are about 20 inches in total length, and have partially-webbed toes. The general colour is blackish above, orange-brown or yellowish-white below; the tail is black for the basal half or three-quarters and the end is white. In South Australia is a form which is more buff-coloured throughout, which was named *H. fulvolavatus* by Gould, and has since been regarded as a sub-species of *H. chrysogaster*, though it may yet prove to be a full species. Another species (*H. caurinus*), described in 1909 from north-western and northern Australia, is of a much clearer and less yellowish gray than any other species of *Hydromys*; the length of the white tail-tip is variable. Apparently a small island representative of the latter species is *H. melicertes*, described from Melville Island, Northern Territory, by Thomas in 1921.

Mastacomys differs from *Rattus* in the remarkably broadened molar teeth; the only species known to be living to-day is *M. fuscus* (Broad-toothed Rat), which inhabits Tasmania, one immature specimen being found in Victoria, and only cave remains in New South Wales. A second species (*M. mordicus*) was described in 1922 from a fragment of the jaw with three molars, found in a guano cave in the Mount Gambier district of South Australia; apparently about three-fourths the size of *fuscus*, it is not known if living specimens are now to be found. In *M. fuscus* the anterior molars are each more than half as broad again as the palatal space between them.

Leporillus conditor.

In *Lcporillus, Notomys, Ascopharynx, Conilurus*, and *Mesembriomys*—all peculiar to Australia—the hind-limbs are relatively more elongated than in ordinary rats and mice; the ears and tail are both long. Members of two genera (*Notomys* and *Ascopharynx*) hop, kangaroo-like, on their hind-limbs, and are hence sometimes called jerboa-rats. One of the best-known species is the Nest-building Jerboa-rat (*Leporillus conditor*) of South Australia, which once extended

Fawn-coloured Jerboa-rat (*Notomys cervinus*).

into western New South Wales and Victoria; in this species one or several families construct a large conical nest of closely-woven sticks. A second stick-nest builder (*L. jonesi*) was described in 1921 from Franklin Island in Nuyts' Archipelago, South Australia.

Uromys comprises a number of species, some of very large size, which differ from *Rattus* in having the scales of the tail fitted together by their edges after the fashion of a mosaic, instead of overlapping. Most of the species are Papuan, but the genus ranges from north-eastern Australia to the Aru Islands. *Uromys macropus*, the Giant Rat of north-eastern Australia, has the head and body together 14½ inches long.

The giants of the rat tribe are the two or three species of *Mallomys* (Papuan giant rat), of which one—*M. hercules*—grows to a length of over 18 inches, tail not included.

Several indigenous rats and mice are occasionally known to multiply so greatly as to become a pest to grain and other produce. But where such a visitation has taken place on an extensive scale (as in 1917), and a careful investigation has been made, it has usually been due to the introduced domestic mouse (*Mus musculus*), which, with the European black and brown rats (*Rattus rattus* and *R. norvegicus*), was introduced with the advent of the white race, and has penetrated to the remote districts.

See Oldfield Thomas's 'Classification of Rodents' in the *Proceedings* of the Zoological Society of London (1896); Ogilby's *Catalogue of Australian Mammals* (1892); Longman's *Notes on classification of Common Rodents*; also Longman's *List of Australasian and Austro-Pacific Muridae* (1916).

W.A.H.

Roller. See DOLLAR-BIRD.

Roman Catholic Church. Within a week of Phillip's arrival in Botany Bay, a French expedition under the command of La Pérouse anchored in the same waters. With it were two priests, the Abbé Monges and Father Receveur, O.F.M. (q.v.), who acted in the dual capacities of naturalist and chaplain. Father Receveur, who had been wounded by the natives of the Samoan group (where the fleet had put in for water in December 1787), died on 17 February 1788 while the French vessels were in the Bay and was buried on the neighbouring shore; his monument may be seen in the La Pérouse reserve at Botany Bay. It is not too much to assume that Mass would be celebrated there for his soul by his fellow-chaplain; but, as the expedition was wrecked in the Santa Cruz group a little later, no documentary evidence is available.

A Protestant chaplain was appointed to the First Fleet, but no provision was made for the spiritual wants of Catholic convicts, although

two priests had applied for permission to accompany it, and offered to pay their own expenses. In the new penal settlement attendance at religious service was made compulsory for all; the Catholic convicts—including, before many years were over, thousands of Irish 'rebels' of 1798—were quite unprovided for spiritually, and even forced to attend services against the dictates of conscience. For 32 years this violation of religious rights continued, broken only by two short periods of toleration. In 1800 Father Dixon (q.v.), deported for aiding the 1798 rebellion, reached Sydney, and in 1803 was for a time conditionally emancipated and allowed to exercise his priestly functions. By him the first officially allowed Mass was celebrated on 15 May 1803; but the disturbances of 1804 caused the withdrawal of the privilege. He, Father O'Neil (also deported for alleged sympathy with the United Irishmen and landed in Sydney in 1801), and Father Harold (deported about the same time as Father Dixon, but sent to Norfolk Island and not allowed to return to Sydney till 1808) may, however, have ministered privately to their co-religionists. O'Neil returned to Ireland in 1803, Dixon in 1808, and Harold (via the United States, where he was associated with the 'Trustee' schism at Philadelphia) in 1813. In 1817 Father Jeremiah O'Flynn—at first a Cistercian monk, secularized in 1816 to fit him for the post of prefect apostolic of New Holland—sailed for Port Jackson without official sanction from the British government, and was allowed by Macquarie, on representation that his credentials from Earl Bathurst were on the way, to remain in the colony. He evaded orders to leave the colony when after some delay his credentials did not arrive, but in May 1818 was arrested and deported. This episode is of importance not because O'Flynn rendered his Church any great services while in New South Wales, but because his deportation—which was discussed in the house of commons and protested against throughout the United Kingdom—aroused public opinion against the intolerance which had hitherto characterized the official treatment of Catholic convicts. Within a year of his deportation arrangements were being made to remedy the grievance, and on 3 May 1820 two officially recognized missionaries reached Port Jackson.

In 1819 Dom Edward Bede Slater, O.S.B., was appointed vicar apostolic of the Cape of Good Hope, with jurisdiction over 'Madagascar, Mauritius and New Holland with the adjacent islands.' The extent of his diocese was enormous, but the far distant 'New Holland' immediately claimed his attention. Calling for volunteers from Ireland to take up the just established chaplaincies, he obtained the services of two Irish priests—John Joseph Therry (q.v.) and Philip Conolly (q.v.); the latter, being the senior, was made the superior of the new mission. Bearing letters of appointment from Lord Bathurst to Governor Macquarie, they sailed from Cork in the *Janus* transport on 5 December 1819, and landed in Sydney on 3 May 1820. Thus and then was founded the Catholic Church in Australia. The activities of the two priests were much impeded by harassing official regulations, which restricted their interference in any 'mixed marriages,' and expressly forbade them to interfere with or visit the government schools. Father Therry, finding his protests vain, and being a man of strong character, announced that he would obey all just regulations, but would disobey any that conflicted with the Divine law. In the end he got his way in most matters; but government schools remained closed against him for many years, the official view apparently being that Catholic children forfeited their faith when they entered such schools. He was thus forced to provide schools of his own; in 1822 he temporarily used a private school in Sydney, but in 1824 built one in Sydney and another in Parramatta. In 1822 the mission was divided, Father Conolly retiring to Tasmania (where he remained until his death in 1839), and Father Therry administering the mainland settlement single-handed until the arrival in 1826 of Father Power. Father Therry's special ambition was the establishment of a parochial church building in Sydney, and Macquarie gave him a site on the far edge of Hyde Park near the convict barracks—then a distinctly undesirable site. On 29 October 1821 Macquarie laid the foundation-stone of a rather elaborately planned building, and Father Therry dedicated it under the title of the Blessed Virgin Mary. Brisbane soon after his arrival promised financial support, particularly because the Catholic population was on the whole extremely poor; but in spite of frequent appeals no actual assistance was given until 1824, and this was withdrawn in 1827.

Under Brisbane Catholics were treated sympathetically. The work of so vast a mission was, however, more than one priest could perform; he had to minister to about 10,000 Catholics scattered over a vast area, the gaols claimed a great deal of attention, and the convicts outside them—working in chain-gangs or as assigned servants—the hospitals, the schools, and the duplication of Mass on every Sunday at Sydney and either Parramatta or Liverpool, were all part of the burden. His diaries tell a wonderful story of missionary work. To add to his troubles Archdeacon Scott, the head of the Anglican Church, with the undisguised support of Governor Darling and the immense power and prestige afforded by the clergy and school corporation act of 1825, attempted to control Catholic administration. At the census of 1828 the total population numbered 36,598; of these 25,248 were Protestants of all denominations, and 11,236 Catholics. Anglicans alone received as much as £91,500 during five years; during the same time Catholics benefited to the extent of £1000. This was largely due to the influence of Darling, who was a martinet in religion as well as in politics, and had conceived the suspicion that Therry was building up an opposition to his administration among the convict and emancipated Catholics. The records of the time are full of Darling's complaints to the authorities in London and Therry's outspoken refusals to forgo any of his rights as a priest. At the end of 1826 he was unjustly deprived of his official pay and replaced as official chaplain by Father Daniel Power—an easygoing, sickly man, handicapped by unfamiliarity with the English language—who died on 14 March 1830; but, officially recognized or not, Therry was still the centre of Catholic work and the beloved pastor of all Australian Catholics.

The advent of Catholic emancipation in Great Britain brought about a great change in Australian conditions, which was emphasized by the appointment of the liberal Bourke in place of the martinet Darling. In 1829 Roger Therry, a staunch Catholic, reached Sydney with the post of commissioner of the court of requests; in 1831 came Father Dowling; in 1832 Father

McEncroe, to share Therry's arduous labours; and on 18 February 1833 Father Ullathorne (q.v.), arrived in Port Jackson as vicar general, with authority over the whole Catholic body. He was young; his abilities were of untold value to the Church in Australia, and in later years justified his appointment as archbishop of Birmingham; the mission was so regulated at his hands, and its disordered and temporary achievements so established, that within two years it was deemed fit to be constituted a diocese. On 13 September 1835 Bishop Polding (q.v.) arrived as first vicar apostolic of New Holland.

The following years were eventful. On 29 July 1836 Bourke passed the Church act, by which all religions were placed on an equal footing, and the attempted identification of the Anglican Church with a duly established state religion was defeated. The way was now open for Catholic progress; priests were placed in all the larger towns, and the smaller districts were provided for by systematic visitations. The convicts were given special care under the personal supervision of the bishop. By 1841 Dr. Polding had in his vast diocese 40,000 Catholics, attended by 24 priests, a community of Sisters of Charity, 15 churches, several chapels and 31 schools. In 1841-2 he visited Rome and recommended that new dioceses should be established; in the following year Hobart was made an episcopal see; in 1843 Adelaide was honoured similarly. Dr. Polding was elevated to the archiepiscopate and made primate of all Australia.

In 1842 Dr. Polding reported to Rome that in 1836-41 18,000 convicts had been landed in New South Wales, and 'all Catholics among them have had an opportunity of receiving instruction and approaching the Sacraments.' The education of the children was his special care; the governor in council assigned at first £600 and then £1000 per annum for the support of 80 orphans in 9 Catholic schools; and these schools were opened in all parts of the colony. The sisters of charity attended to about 600 Catholic women convicts in the Parramatta factory. At Melbourne, Yass, Goulburn, Bathurst, Maitland (East and West), Newcastle, Windsor, Campbelltown, Illawarra, Parramatta, Liverpool, and Penrith, priests were stationed and churches, schools, and residences established. At Sydney the cathedral and two chapels supplied the wants of the people, and St. Patrick's church had been begun. A seminary received young men in training for the priesthood, and a certain number of children for schooling; there were also six schools taught by sisters of charity, and other schools under private guidance. In 1843 the Christian Brothers and the Passionist Fathers were introduced into the archdiocese.

While in Rome in 1846 Dr. Polding secured Dr. Davis (q.v.) as his coadjutor bishop, and titular of Maitland; he died in 1854. At the census of 1851 Catholics numbered 58,899 in New South Wales. New sees were erected at Goulburn in 1864, at Bathurst in 1865, and at Armidale in 1869. During Dr. Polding's episcopate two provincial synods were held, at Sydney (1844) and at Melbourne (1859); he founded St. John's College within the university of Sydney, and the historic college of Lyndhurst, which has now passed away. During the night of 29 June 1865 St. Mary's cathedral was destroyed by fire. A temporary wooden structure was erected on the site, and orders were given to W. W. Wardell, the ecclesiastical architect, to prepare plans for a new building. On 8 December 1868 the corner-stone of the new edifice was blessed by the archbishop. Wardell's design was carried out as far as the transepts, and many years later a new architect, John Hennessy, added a crypt and monumental approach; the completion of the building is expected by 1927.

In 1872 Roger Bede Vaughan (q.v.) was appointed coadjutor to Archbishop Polding, with the right of succession to the see of Sydney. Dr. Polding had secured permission to create St. Mary's a Benedictine cathedral and priory, and had intended to work his diocese by an Anglo-Australian Benedictine community. This was found impracticable, and Archbishop Vaughan (who was himself a Benedictine) dissolved the community and appointed the monks to secular missions. At Dr. Polding's death (16 March 1877) he succeeded to the see; his administration was noted chiefly for his brilliant oratorical efforts, for his incessant labours in the cause of Catholic education, and for the personal interest he showed in obtaining money for the building of St. Mary's. He died in England on 18 August 1883.

On 21 March 1884 Patrick Francis Moran (q.v.) was appointed to Sydney and was shortly afterwards created a cardinal. The plenary synod held in Sydney in 1885 recommended the establishment of new dioceses in Australia; consequently in 1887 the dioceses of Grafton (now called Lismore), Wilcannia, Sale, and Port Augusta, and the vicariates apostolic of Kimberley and Queensland (for aborigines) were made, and the sees of Adelaide, Brisbane, and Hobart were elevated to the archiepiscopal dignity. During Cardinal Moran's administration three plenary synods were convened (1885, 1895, 1905), and congresses under his presidency were held in 1900, 1904, and 1909. One of the most noteworthy deeds of his time was the building of St. Patrick's ecclesiastical seminary at Manly near Sydney. The land had been a government grant, and a large sum of money left by Archbishop Vaughan, though insufficient to cover the whole cost of building, facilitated the cardinal's scheme for founding a seminary for the whole of Australia. The foundations were laid in 1885, and the building dedicated in 1888; at present the seminary has 100 students from various Australian dioceses. A junior seminary, eventually intended for training Australians for missions in the Pacific, was built at Springwood in New South Wales in 1910, and has at present over 60 students. An Australian college may be founded at Rome in the future. In March 1889 Bishop Higgins was appointed auxiliary bishop to Cardinal Moran, but in May 1899 was transferred to Rockhampton, and still later to Ballarat. On 20 July 1901 Dr. Michael Kelly, rector of the Irish college at Rome, was appointed coadjutor with the right of succession, and succeeded the cardinal at his death on 16 August 1911. In 1917 a new diocese was created at Wagga. Archbishop Kelly has been singularly successful in the work of building churches, schools, and charitable institutions; he has now almost completed St. Mary's cathedral, and there are 220 Catholic schools in his diocese, attended by 40,873 children. In the province of Sydney (which coincides with the State of New South Wales) there were in 1925 609 Catholic educational establishments, attended by 73,592 children. In 1921 the centenary of St. Mary's cathedral was celebrated in the presence of all

the Australian hierarchy. In 1922 Dr. Michael Sheehan arrived in Sydney as coadjutor *cum jure successionis* to Dr. Kelly.

PROVINCE OF MELBOURNE.—It is not unlikely that Father Therry visited the newly-founded town on his way to Hobart in 1838. In 1839 Father Patrick Geoghegan was appointed priest in charge of the district, and celebrated Mass on 15 May of the same year. In 1848 the first bishop, James A. Goold (q.v.), was appointed, and in 1850 laid the foundation-stone of St. Patrick's cathedral. The discovery of gold increased the Catholic population from 18,000 in 1851 to 88,000 in 1857. In 1874 the bishop petitioned Rome to form new dioceses in the north and west of Victoria; the sees of Ballarat (first bishop, Dr. O'Connor) and Sandhurst (first bishop, Dr. Crane) were accordingly created, and Dr. Goold was made metropolitan. Dr. Goold introduced the Jesuit Fathers, Christian Brothers, and five orders of religious women, and, after the abolition of the subsidized denominational school system in 1872, founded Catholic schools at which, when he died in 1886, there were over 11,000 children. His successor, Archbishop Carr, arrived in Melbourne in 1887. He completed the cathedral (excepting the towers), and consecrated the edifice on 31 October 1897, entirely free of debt, the total cost having been £230,000. During his term of office the members of the clergy were increased from 66 to 142, and 30 new parishes were made. He introduced the Marist Brothers and 5 orders of teaching sisters. The present archbishop, Dr. Mannix, who succeeded to the see on 6 May 1917, has followed in the broad lines of his predecessor, his most outstanding works being the building of Newman College within the university of Melbourne and the establishment of Corpus Christi College, Werribee, for the training of candidates for the priesthood. There are 133 teaching brothers and 1783 nuns, 1 training college for teachers, 29 superior schools and 238 primary schools, with a total attendance of 53,695; 24 orphanages and homes, and 3 hospitals.

PROVINCE OF BRISBANE.—Moreton Bay, settled in 1825 as a convict settlement, was visited by Father Therry. After colonization had begun in 1842, four Passionist Fathers established a mission for aboriginals on Stradbroke Island, and, although they abandoned this mission, the evangelizing of the blacks was continued by Fathers Luckie and Duncan McNab. The first priests stationed at Moreton Bay were Fathers McGinnety and Hanly, in December 1843. In 1859 Queensland, just separated politically from New South Wales, was formed into a separate diocese with the see at Brisbane, having as first bishop Dr. James Quinn (q.v.). In 1860 there were only 2 priests, 2 churches, 2 schools, and a Catholic population of 7676. The bishop, with official sanction, brought out 10 shiploads of Catholic settlers, but finally abandoned the project on account of sectarian bitterness (see MIGRATION). He founded a Catholic newspaper, *The Australian*, built St. Stephen's cathedral, and established 52 primary schools. A pro-vicariate of North Queensland was formed in 1876, and the see of Rockhampton in 1882. In that year Bishop Dunne succeeded to the see of Brisbane. At the request of the plenary council of Australia (1885) Brisbane was made a separate province, and Cooktown a vicariate. Dr. Dunne died in 1917, and was succeeded by the present archbishop, Dr. James Duhig, who has lived most of his life in Queensland and is distinguished by his untiring energy in visiting every portion of his huge territory, and his statesmanlike utterances on religious and civic subjects. Under his administration the archdiocese has made such marked progress that its further division into more suffragan sees is not far distant. Already provision has been made for establishing an ecclesiastical seminary and a new cathédral. There are 178 priests; 67 brothers, 941 nuns, 102 primary schools, 46 high schools, a university college, a technical school, and 9 charitable institutions, among which are 2 hospitals. The children in Catholic schools number 23,005.

PROVINCE OF SOUTH AUSTRALIA.—When South Australia was founded in 1836 it was intended to be a colony free from convicts, 'papists, and pagans.' When Dr. Ullathorne visited Adelaide in 1840, Gawler refused the school 'either to the Popish priest to go through his Mass, or to the ignorant Catholics to be present at it;' Mass, however, was celebrated in a store. Father William Benson resided there in 1841-4. In 1843 Bishop Murphy (q.v.) was appointed to the see of Adelaide. The hardships of the first years were great; the rented store served as chapel; out of a population of 17,366 in 1844 only 1055 were Catholics. From 1847 to 1851 state aid was given, but was withdrawn in 1852. The gold-rush to Victoria impoverished the diocese, but the bishop sustained his hard lot on 8s. 6d. per week. Later years saw the Church making strides towards its present position. Dr. Murphy was succeeded in 1858 by Bishop Geoghegan (q.v.), who died in 1864. Next came Dr. Sheil (1866-72); Dr. Reynolds (1873-93), during whose term Adelaide was raised (in 1887) to an archbishopric, with a suffragan see at Port Augusta; Archbishop O'Reilly (1895-1915), and Archbishop Spence. Among religious orders the Passionists came in 1846, the Jesuits in 1848, and the Sisters of Mercy in 1857—in which year also a community of the Australian Sisterhood of St. Joseph was established in Adelaide. Among the clergy of the diocese must be mentioned two of great scientific learning—the Jesuit Father Hinterocker, and Father Julian Tenison Woods, a naturalist of eminence whose work is considered under his own name. There are 47 districts containing 136 churches; 84 priests, 39 religious brothers, 490 nuns, 11 high schools, 78 other schools, and 9 charitable institutions. 8241 children attend the schools.

PROVINCE OF PERTH.—In 1842 the Catholic residents of Perth requested Dr. Ullathorne to send a priest to minister for them, and in 1843 Dr. Polding appointed Father John Brady as vicar general of the district. The foundation-stone of the first church was laid on 27 December 1842. Father Brady was consecrated first bishop on 18 May 1845 at Rome, and returned to Fremantle with assistant priests and six Sisters of Mercy. The poverty of the 306 Catholics greatly inconvenienced the work of the mission; but three attempts were made to found native missions, one of which, New Norcia (q.v.) is still flourishing. Dom Serra of New Norcia, first bishop of Port Victoria, was later transferred as coadjutor to Dr. Brady, to grapple with the precarious financial position of the diocese. Bishop Brady returned to Ireland in 1852, and Bishop Serra to Spain in 1862, Father Martin Griver having been appointed administrator in 1859. The latter was made administrator apostolic in 1869, and bishop of Perth

in 1873. Churches were erected at the larger centres, and the cathedral at Perth was dedicated in 1865. Dr. Griver died in 1886, and was succeeded by Dr. Gibney, under whose guidance religious teachers were introduced for Catholic education, and a native mission established at Beagle Bay. He retired in 1911, and was succeeded by Archbishop Clune. The see is now of archiepiscopal rank, having the abbey of New Norcia (founded in 1847), the vicariate of Kimberley (1887), and the see of Geraldton (1898) dependent on it. There are 53 districts, containing 142 churches, which are ministered to by 94 priests; 59 religious brothers, 555 nuns, 15 charitable institutions, and 133 schools attended by 9775 children.

PROVINCE OF TASMANIA.—In 1821 Father Conolly left Sydney for Hobart, where he died in 1839; in 1838 Father Therry was appointed vicar general there, built up a flourishing church, and handed it over in 1842 to Bishop Willson (q.v.) who became a suffragan of the archbishop of Sydney. In 1874 Hobart was named a suffragan see of Melbourne, but in 1888 was made an archiepiscopal see, and Tasmania a separate province—unique in this respect that it has no suffragan see. Under Dr. Willson the Church made rapid strides, his especial care being the convicts. His successor, Bishop Murphy (1866-1907) devoted his attention to Catholic education, introducing several teaching sisterhoods and the Christian Brothers, and building schools, the last of which was St. Virgilius' College at Hobart. He was nominated archbishop in 1888, and died in 1907, when he was succeeded by his coadjutor Archbishop Delany. In 1919 Archbishop Barry was appointed coadjutor. There are 21 districts in the archdiocese of Hobart, containing 72 churches; 30 priests, 13 religious brothers, 167 nuns, 4 high schools, 26 primary schools, 4 superior day schools, and 2 charitable institutions. There are 3513 children attending the schools.

The Catholic Church in Australasia is under the jurisdiction of the Sacred Congregation *de Propaganda Fide*. The growth of the Church was specially recognized by the holy see on 15 April 1914, when it established an apostolic delegation in Australia. The first apostolic delegate was Archbishop Cerretti (q.v.), now a cardinal and papal nuncio in Paris; he was succeeded on 14 May 1917 by Archbishop Cattaneo.

E.M.O'B.

Rosaceae, a family of trees, shrubs, and herbs with alternate (simple or compound) leaves. It is better represented in the cooler parts of the northern hemisphere than within the tropics or in the southern hemisphere. Of the Australian genera one only, *Stylobasium*, is endemic. The calyx has 4 or more lobes; petals as many as calyx lobes, inserted on the calyx at the base of the lobes; styles distinct; fruit-carpels either free, or combined with each other or with the calyx. *Alchemilla* is a genus of herbs with small green flowers; of the two indigenous species *A. vulgaris* is the common 'lady's mantle' of Britain, where it grows in wet pastures and shady woods. *A. arvensis* (Parsley-piert of Britain), also found in Europe, is a small annual with deeply incised leaves. *Agrimonia*, mostly herbs with fruits covered with hooked bristles, is represented by *A. eupatoria* (Agrimony). Of *Potentilla* the only indigenous species, *P. anserina*, is the silver-weed of Britain; it has rather large yellow flowers on long stalks, and feathery leaves that are silvery-white with a silky down. See ACAENA, GEUM, PARINARIUM, and RUBUS.

Rosebush. See ANONACEAE.

Rose Hill, a name which, since it was first coined by Phillip, has represented three different areas. From 2 November 1788 to 4 June 1791 it was the name of the district which is now Parramatta. From 1791 to about 1850 it denoted the area immediately surrounding government house there—i.e. a portion of what is now Parramatta Park. It then fell out of use, but in 1885 was revived to denote an area some distance south-east of Parramatta, between the Parramatta River and Duck Creek, which is chiefly occupied by a racecourse. See PARRAMATTA.

Rosella. See PARROTS.

Rosenhain, WALTER, born in Melbourne on 24 August 1875 and educated at Wesley College and the university of Melbourne, and at St. John's College, Cambridge (B.C.E., 1901; D.Sc., 1909), superintendent of the metallurgy department in the National Physical Laboratory, London, since 1906, is unquestionably one of the foremost metallographers in the world, combining an intimate knowledge of physical science with an engineer's appreciation of practical applications of results. His early work in metallurgy concerned the internal mechanism of the deformation of metals, and the development of a theory to account for certain properties of metallic crystal aggregates. This became known as Rosenhain's amorphous cement theory, and, with modifications suggested by recent X-ray investigations, is at present accepted by most metallographers. At the national physical laboratory his critical appreciation of apparatus and his inventive capacity have combined to make the equipment of the metallurgy department of that institution very complete. During and since the war period his energies have been turned towards a complete investigation of the properties and possibilities of the light alloys of aluminium and magnesium with other metals.

He was Carnegie medallist of the Iron and Steel Institute, president of the Optical Society, London, and fellow of the Royal Society (1913). His published works include *Glass Manufacture* (London, 1908); *An Introduction to the Study of Physical Metallurgy* (London, 1914); with P. A. Tucker, *The Alloys of Lead and Tin* (London, 1908); and with S. L. Archbutt, *The Constitution of the Alloys of Aluminium and Zinc* (London, 1911).

W.A.O.

Rosenthal, SIR CHARLES, born at Berrima, New South Wales, on 12 February 1875, began practice as an architect at Sydney in 1901. He joined the garrison artillery at Geelong, Victoria (as a gunner) in 1892, was discharged a year later and appointed to the garrison artillery in New South Wales (2nd lieutenant, 1903; lieutenant, 1904; captain, 1905; major, 1908; lieutenant-colonel, 1914; colonel, 1916; brigadier-general, 1916; major-general, 1918). At the commencement of the war in 1914 he was appointed to command one of the three field-artillery brigades of the 1st Australian division. At the landing at Anzac he obtained leave to take some of his guns into the firing-line on a ridge to the right of the position; some of them remained there till the end of the campaign. After the evacuation of Gallipoli he was given command of the artillery of the 4th Australian division,

which was raised and organized in ten weeks. His thrust and high courage led to his transfer in 1917 first to the command of the 9th infantry brigade and subsequently to that of the 2nd division, which he commanded in the great advance on 8 August 1918 and at the capture of Mont St. Quentin. He was wounded on several occasions. In the demobilization period of 1919 he commanded A.I.F. depots in England. After returning to Australia he was elected to represent Bathurst in the parliament of New South Wales, but lost the seat in 1925. See AUSTRALIAN IMPERIAL FORCE. (C.B., 1915; C.M.G., 1917; D.S.O., 1918; K.C.B., 1919.)

C.E.W.B.

Rosewood, a name used in Australia chiefly for the timber of *Dysoxylon Fraserianum*, which is the rosewood of commerce. The name is also applied to species of *Acacia* (q.v.) and sandalwood (q.v.). For bastard (spurious) rosewood see MELIACEAE; for western rosewood see HETERODENDRON.

Rosmead, LORD. Sir Hercules George Robert Robinson (1824-1897), first baron Rosmead, born at Rosmead in county Westmeath, Ireland, on 19 December 1824 and educated at Sandhurst, joined the army on 27 January 1843 (2nd lieutenant, 1843; 1st lieutenant, 1844). In 1846 he retired to take an appointment under the commissioners of public works for Ireland and later under the poor law board; he did service in the Irish famine of 1848, and in 1852 was made a special commissioner to enquire into Irish fairs and markets. On 4 March 1854 he was appointed president of Montserrat, assuming office on 12 April; on 28 March 1855 he was made governor of St. Christopher and the Leeward Islands; in 1859 he was promoted to Hong Kong, administered the colony during the 1860-1 war with China, and negotiated with the Chinese government the cession of Kowloon. In 1863 he was placed on a commission to enquire into the finances of the Straits Settlements, and on 30 March 1865 became governor of Ceylon, where he made the public works department one of the most efficient in the colonial service.

On 3 June 1872 he assumed the governorship of New South Wales, and in September 1874 negotiated the annexation of the Fiji Islands, administering the government at Suva until the arrival of Sir Arthur Gordon. During his term in New South Wales the chief subjects of controversy were the Victorian and South Australian border duties, the release of Frank Gardiner (q.v.) and other bushrangers, and Chinese immigration. On 19 March 1879 he was transferred to New Zealand, and again transferred in August to The Cape Colony, where he was also high commissioner of South Africa. He retired from the public service on 1 May 1889, and settled in London, occupying himself with commerce and banking. On 30 May 1895 he was reappointed to The Cape Colony, and in January 1896 obtained from Paul Kruger the release of the 'Jameson raiders.' In August 1896 he was raised to the peerage as Baron Rosmead. He was relieved on 21 April 1897, returned to London, and died on 28 October. (Kt. Bach., 1859; K.C.M.G., 1869; G.C.M.G., 1875; P.C., 1882.)

J.V.C.-B.

Ross, SIR ROBERT DALRYMPLE (1828-1887), born at St. Vincent in the West Indies in 1828, and educated in England, in May 1855 joined the commissariat department of the army and during the Crimean war was attached to the Turkish contingent. In 1856 he volunteered for service in West Africa, and in 1858 acted as colonial secretary of the Gold Coast colony; returning to England in 1859, he was sent to China with the expeditionary force (1860) and until 1862 was stationed at Hong Kong. Transferred thence to South Australia, he became private secretary to Sir Dominick Daly; in 1864-6 he served with a detachment of British troops from South Australia in the Maori war. On his return to England in 1869 he strongly advocated the establishment by the government of India of a remount depot at Port Darwin, a transcontinental telegraph-line, and a transcontinental railway on the land-grant system. In 1870 he had charge of flying columns in western Ireland; in 1871 he retired and returned to South Australia. In 1875-81 he sat for Wallaroo and for Gumeracha in the legislative assembly; was treasurer in the Colton ministry of 1876-7, and speaker from 1881 till his death on 27 December 1887. His chief interests were education and fruit-growing (especially viticulture). (Kt. Bach., 1886.)

A.D.A.

Rotary in Australia. In April 1921 two Canadians, James W. Davidson of Calgary and Colonel Layton Ralston of Halifax, arrived in Australia duly authorized by Rotary International to establish Rotary clubs in the Commonwealth. These commissioners went first to Melbourne, where in April 1921 they founded the first Australian Rotary club under the presidency of Professor W. A. Osborne; in May they established the Rotary club of Sydney with Sir Henry Yule Braddon as president. Both of these clubs have grown in numbers and influence, and have rendered conspicuous service in their respective communities. Thus in 1924 the club in Sydney organized a 'boys' week' with the twofold object of bringing before the community the supreme importance of the boy as the man of to-morrow, and of giving financial aid towards extending the operations of the Boys' Brigade; in 1925 the Melbourne club also organized a boys' week to help the boy scout movement. Rotary International, which is the central organizing and controlling authority, subsequently appointed as honorary commissioners in Australia, Professor W. A. Osborne of Melbourne, Sir Henry Braddon and B. R. Gelling of Sydney, and Peter MacGregor of Brisbane. Under the direction of these rotarians new clubs have been (1926) established at Ballarat, Bendigo, Geelong, Adelaide, Hobart, Launceston, Newcastle, Parramatta, Brisbane, and Rockhampton.

The notion of such a movement was conceived by Paul Harris, a lawyer of Chicago, and in February 1905 the first Rotary club in the world was formed in that city. By August 1910 16 clubs had been established in America and had formed themselves into a National Association. Two years later was formed the International Association, to provide for the constitution of clubs in Winnipeg (Canada) and London (England). Since that time Rotary has extended almost throughout the world, there being now about 2200 clubs spread over the United States, Canada, Great Britain and Ireland, South America, the continent of Europe, Australia, New Zealand, South Africa, India, Japan, and China.

The membership is unique, inasmuch as each member is the representative of a distinct business or profession in the community. The motto is service, and the individual rotarian is thus

expected to aim at real and unselfish help to others in his business or professional activities and in his personal relations with his fellowmen. It is entirely free from all religious and political creeds, being based on the practical ethical principle that he profits most who serves best. The objects of Rotary are thus defined in its constitution: to encourage and foster (*a*) the ideal of service as the basis of all worthy enterprise; (*b*) high ethical standards in business and professions; (*c*) the application of the ideal of service by every rotarian in his personal, business, and community life; (*d*) the development of acquaintance as an opportunity for service; (*e*) the recognition of the worthiness of all useful occupations, and the dignifying by each rotarian of his occupation as an opportunity to serve society; and (*f*) the advancement of understanding, goodwill, and international peace through a world fellowship of business and professional men united in the Rotary ideal of service.

Rotary has also its code of ethics, concerning which it will be sufficient to quote one paragraph: 'To realize that I am a business man and ambitious to succeed; but that I am first an ethical man, and wish no success that is not founded on the highest justice and morality.' It can be truly said that Rotary is doing work of real value in the world by linking together men of different races in a fellowship based on a common ideal.

B.R.G.

Rotifers, a group of microscopical animals related to free-swimming worms, divided into four orders, Rhizota (rooted), Bdelloida (leech-like), Ploima (sea-worthy), and Scirtopoda (skippers). They are all aquatic and mostly freshwater, the marine species being few. Their habitats are diverse—the intestine of a worm, the moisture on mosses, and under a considerable thickness of antarctic ice. Many species when gradually dried form a protective pellicle and become inactive; they may revive after remaining quiescent for years. The forms found are mostly female. Males in the majority of species are unknown, and those identified are comparatively few and mostly destitute of an alimentary system. Reproduction is mainly asexual; the sexual egg retains its vitality when pools dry up, hatching when they are again filled. The typical form is *Rotifer vulgaris*, which has a leech-like, tapering body, having in front a double wreath of cilia—the corona—the hairs of which, vibrating rhythmically, seem to imitate the rotation of a toothed wheel. Behind is a foot provided with minute spurs.

The corona, which is more or less perfect in all species, is both a locomotory organ and a means of drawing in food from the surrounding water. The outward shape varies greatly. Some species are elongated, and secrete a gelatinous sheath (Floscularia); others live in tubes of fabricated pellets, faecal matter, or horny secretion (Melicertadae); free-swimming forms may be cased in a lorica, plain or spiny; others are soft-bodied and sac-like. *Trochosphaera* is an almost perfect sphere. Their internal structure is highly organized for such minute animals (their length varies from one three-hundredth to one eighth of an inch); there is a complete alimentary system with jaws, stomach, and intestine. The internal organs are bathed in the fluid of the body cavity. The excretory organs commence with minute 'flame cells' hanging in the body-cavity; these cells consist of a flattened sac with an internal undulating membrane. Fluids entering by osmosis through the walls of the sac are propelled by the undulations of the membrane through two lateral tubes to a contractile vesicle communicating with the cloaca. The nervous system consists of a central ganglion, whose nerve-fibres connect with tactile processes and with pigmented bodies that are thought to be organs of vision.

The distribution of rotifers is world-wide, many species being cosmopolitan. Up to the present 237 species (21 new) are recorded for Australia. Five of the new species belonging to the genus *Lacinularia* are endemic; they possess unique characters, and form large, conspicuous colonies. *L. pedunculata* and *L. striolata* anchor the colony to submerged objects by a peduncle half an inch in length. The last-named species originates its colonies by a remarkable swarming process; the 'resting eggs' hatch out when rain

FIG. 1.
Young female, dorsal view, x 285.

FIG. 2.
Swarm of young rotifers forming a colony, x 35.

FIG. 3.
Adult female, dorsal aspect, x 66.

fills the dried-up pools, and the free-swimming juveniles (fig. 1) become entangled in the mucus which they exude; the swarm ultimately attaches itself to some object, the individuals arrange themselves radially (fig. 2) and the colony

commences to form a continually lengthening peduncle. The individuals develop into adult females (fig. 3), and asexual eggs quickly appear, hatch out, and the young swim away to form fresh colonies. The size of the colonies increases with their number, a larger number of young forms being available, and this may go on until single colonies contain thousands of individuals. The last stage is the production of males, whose function is probably to fertilize eggs which will originate a new generation in the following season. J.Sh.

Rough Fig. See TREMA.

Roughy (*Trachichthys australis*), a small fish six inches long, from the south-eastern coasts of Australia. It is usually discovered washed up on beaches after storms, and attracts attention on account of its singularly rough scales and integuments, even the fin-rays being covered with minute asperities. Though occurring in shallow water, the roughy is the type of a family of deep-sea fishes (Trachichthyidae) widely distributed throughout the Indian, Pacific, and Atlantic oceans, and all having more or less rugose integuments. Several species of the genus *Hoplostethus* are taken by trawlers off Australian coasts, one being identical with a fish first discovered in the Mediterranean, and since trawled in Indian seas, off Japan, and in the Atlantic. These have curious cavities in the cranial bones, covered with membrane and filled with fluid, the purpose of which is not known. The Sandpaper-fish (*Paratrachichthys trailli*), common in deep water off the coasts of southern Australia, is, as denoted by its vernacular name, covered with a rough skin resembling sandpaper, and is remarkable in having the ventral orifice moved forward to a position in advance of the ventral fins. See AUSTRALIAN SALMON. A.R.McC.

Round-worms. See NEMATHELMINTHES.

Rous, HENRY JOHN (1795-1877), second son of the earl of Stradbroke, was born on 23 January 1795, educated at Westminster, and entered the navy in 1808 (lieutenant, 1814; commander, 1817; captain, 1823; rear-admiral, 1852; admiral, 1863), distinguishing himself while in the *Bacchante* in 1812-3 for gallantry in several cutting-out affairs in the Adriatic. In 1825 he was appointed to the *Rainbow* frigate, and reached Port Jackson early in 1827; in June of that year he took Darling to Moreton Bay, and his father's name was given to Stradbroke Island as a compliment. While stationed on the eastern coast in 1829 he discovered the estuaries of the Clarence and Richmond rivers, but no notice was taken of them until they were rediscovered in 1840. He was an early patron of Australian sport, especially of racing; Emigrant, a stallion he imported, was the sire of many good racehorses later; he also organized the first regatta held in Port Jackson, on 30 April 1827 (see ROWING AND SCULLING). In 1829 he left Australia, and in 1836 the navy, and devoted himself temporarily to politics and permanently to horse-racing. He died on 19 June 1877.

Rouse, RICHARD (1774?-1852), arrived in New South Wales as a free settler by the *Nile* in December 1801 and received the usual indulgences (see MIGRATION), including a land-grant at Mulgrave Place on the Hawkesbury. In 1806 Bligh appointed him superintendent of public works; he lost the position when in 1808 he supported the deposed governor, but was reappointed by Macquarie in January 1810. In 1816 he acquired between Parramatta and Windsor 450 acres which (according to a family legend) Macquarie named for him 'Rouse Hill,' and to this estate he retired in 1825. Meanwhile he had become interested in sheep-breeding. In 1823 his sons, John Richard and Edwin, took flocks over the mountains to Melrose on the Fish River; by 1825 Edwin had pushed on to the Cudgegong River and there his father took up 4000 acres, which by subsequent purchases developed into two stations, Biraganbil and Guntawang. Biraganbil was taken over by the eldest son, John Richard, who became blind, and afterwards by the youngest son, George, who in 1864 established the well-known Biraganbil sheep-stud; both were prominent racing men, and kept extensive stables. Guntawang was managed by Edwin, who in 1846 helped to found the Mudgee pastoral and agricultural association. Richard Rouse died on 10 May 1852.

Rowing and Sculling. The first boat-race in Australia of which there is any record was rowed on 16 May 1818 in four-oared gigs over a course from Bradley's Head to Sydney Cove. Four crews took part, captained by John Piper (q.v.), Lawlie, an officer of the *Batavia*, Magnus Johnson, master of the *Guildford*, and John Bell, master of the *Minerva*. Piper's crew won with ease in 15 min. Piper was an enthusiast, and did much to arouse interest in the sport. His crew were most successful up to 24 February 1827, when in a match for 200 guineas they were beaten by one from H.M.S. *Rainbow* under Captain Rous (q.v.). The first regatta held in Australia took place at Hobart on 5 January 1827, the second in Port Jackson on 5 April in the same year. On 24 January 1832 four amateurs defeated a crew from the ship *Strathfieldsaye*, and on 3 May two officers of the navy defeated two Sydney laymen in a pair-oar race—the first purely amateur boat-race in Australia. A regatta held on 26 January 1837 to commemorate the founding of Sydney was so successful that it was decided to make it an annual fixture; in 1840 it was formally named 'The Anniversary Regatta,' and prize-money to the amount of £500 was donated; the gentlemen's race was won by J. J. Harpur's crew. At this time rowing was the recognized popular pastime; racing and cricket had not taken a hold, and football was played only occasionally. In 1849 the regatta was extended over two days, and in 1860 amateur rowing was introduced. Thirteen years later saw the institution of amateur four-oar races, open to clubs not less than three months in existence. The first winning crew included W. Deloitte, Q. L. Deloitte, H. H. Bligh, and E. Chisholm, who defeated the brothers William, Henry, Fred, and G. H. Fitzhardinge. In 1888 (the centenary of the colony) a carnival regatta was held at which the prizes were over £1200—the biggest regatta ever held in Australia; over 1200 men were required to man the boats. In the meantime rowing gained favour in the other colonies, and amateur clubs sprang up there.

On 4 February 1863 the first intercolonial race was rowed in gigs on the Parramatta River; the New South Wales representatives were W. Mason, H. Freeman, J. F. Fitzhardinge, and H. B. Fitzhardinge, with M. A. Fitzhardinge (father of Roger Fitzhardinge, who in 1912 stroked the first Australian eight-oar crew to compete at Henley in England, and at the Olympic games

at Stockholm) as cox. They defeated a Victorian four, H. Woolnough, J. Bennett, J. Irving, and W. McCutcheon. In 1872 Sydney won two races rowed at Sydney and Hobart; in the following year six crews competed—Melbourne, Ballarat City, Sydney, Ballarat, Geelong, and Hobart Town—and the Melbourne crew won what was destined to be the last intercolonial gig contest. Towards the end of 1877 the Victorian Rowing Association, which had been formed about a year before, suggested to the Sydney and Mercantile clubs (New South Wales had not then a Rowing Association) that an eight-oar intercolonial amateur race should be rowed on the Yarra; the Sydney club refused to agree unless Melbourne first rowed a four-oar race on the Parramatta, a visit by a Sydney crew to Melbourne in 1874 not having been returned, but the Mercantile club decided to take part in an eight-oar contest unconditionally.

On 6 March 1878 the first intercolonial eight-oar race took place on the Yarra, and the Victorians won. The crews were:—*Victoria*—R. Ward, 10.10; J. Booth, 11.2; W. Bray, 11.8; J. L. Irvine, 11.0; W. H. Trickett, 11.13; J. M. Simpson, 11.4; T. H. Young, 12.11; G. Fairbairn, 12.2 (stroke); F. Fairbairn, 5.6 (cox).

INTERCOLONIAL AMATEUR EIGHT-OAR RACE.

Year.	Victoria.	New South Wales.	Queensland.	Tasmania.	Western Australia.	South Australia.	Rowed at.
1878... ...	1	2	...	...	...	...	Melbourne.
1879... ...	2	1	...	...	...	...	Sydney.
1880... ...	1	2	...	...	...	...	Melbourne.
1881... ...	1	2	...	...	...	...	Sydney.
1882... ...	2	1	...	...	...	...	Melbourne.
1883... ...	1	2	...	...	...	...	Sydney.
1884... ...	1	2	...	...	...	...	Melbourne.
1885... ...	2	1	4	3	...	...	Sydney.
1886... ...	1	2	...	...	...	...	Melbourne.
1887... ...	1	2	...	...	...	...	Sydney.
1888 (June)	1	2	...	...	...	...	Melbourne.
1888 (Sept.)	1	2	...	...	...	...	Sydney.
1889... ...	1	2	...	...	...	...	Melbourne.
1890... ...	1	3	2	...	...	...	Sydney.
1891... ...	3	2	1	...	...	...	Melbourne.
1892... ...	1	2	3	...	...	...	Brisbane.
1893... ...	2	1	3	...	...	...	Sydney.
1894... ...	1	2	3	...	...	...	Melbourne.
1895... ...	1	2	3	...	...	...	Brisbane.
1896... ...	1	2	3	...	...	...	Sydney.
1897... ...	1	...	3	...	2	...	Melbourne.
1898... ...	1	...	2	...	...	...	Brisbane.
1899... ...	1	2	4	...	...	3	Melbourne.
1900... ...	1	2	3	...	...	4	Brisbane.
1901... ...	1	2	4	...	...	3	Sydney.
1902... ...	1	5	3	...	4	2	Adelaide.
1903... ...	1	4	2	...	5	3	Melbourne.
1904... ...	1	4	3	...	5	2	Brisbane.
1905... ...	1	3	6	2	4	5	Sydney.
1906... ...	2	3	...	1	4	5	Perth.
1907... ...	1	4	3	2	5	6	Adelaide.
1908... ...	2	1	5	3	6	4	Melbourne.
1909... ...	2	3	4	1	...	5	Brisbane.
1910... ...	2	1	5	3	4	6	Hobart.
1911... ...	2	1	6	3	5	4	Sydney.
1912... ...	1	4	...	2	5	3	Perth.
1913... ...	...	...	...	2	3	1	Adelaide.
1914... ...	4	5	6	1	3	2	Melbourne.
Interval during the war when no racing was done.							
1920... ...	5	4	6	3	2	1	Brisbane.
1921... ...	3	6	5	2	1	4	Launceston.
1922... ...	2	...	5	4	3	1	Sydney.
1923... ...	3	4	...	5	2	1	Perth.
1924... ...	...	2	1	5	4	3	Adelaide.
1925... ...	4	3	...	2	1	...	Melbourne.

New South Wales—W. R. Benson, 10.1; J. Arthur, 11.2; J. McKansey, 11.1; W. G. Brett, 11.11; J. H. Wilkinson, 11.12; T. F. Strange, 12.8; W. Dind, 11.5; C. C. Medcalf, 10.2 (stroke); W. Thomas, 5.7 (cox). Up to 1885 New South Wales and Victoria were the only competitors; then Tasmania and Queensland came in, Queensland dropped out soon, but re-entered permanently in 1890, and Tasmania did not enter again till 1905. The Queensland crew in the 1890 race were F. W. de Littler, W. E. Molle, H. T. Bell, F. M. Armstrong, A. H. Drury, C. Bell, W. A. D. Bell, F. Lawson (cox). The race, which was rowed on the Parramatta, was sensational. The day was rough, and the crews had a strong wind behind them; the Queenslanders were fairly well at home on the rough water, and led for nearly 2¾ miles, then Victoria drew up to half a length, and Molle caught a crab and broke his oar; he at once jumped into the river—but Victoria won. In 1897-8 there was trouble over the amateur question, and New South Wales did not compete; the Victorian Association declined to withdraw a member of its crew who had competed for a cash prize in a cycling race, and whom New South Wales regarded as a professional. In 1897 Western Australia competed for the first time, and won second place. The crew were J. Harris, 11.7; J. Porteous, 10.0; J. B. Lockington, 11.10; J. H. Hurst, 11.4; J. A. Horsburgh, 12.0; P. Ryan, 11.7; J. Donald, 11.0 (stroke); J. Coumtian (cox). South Australia came in in 1899, and was represented by J. Irvine, 11.0; W. Plaisted, 10.8; K. McKenzie, 11.4; W. A. Abernethy, 11.12; J. H. Walter, 12.6; W. B. Walker, 10.2; C. Lawson, 10.10; J. H. Clouston, 10.4 (stroke); W. Sweeny (cox). Six years later all the six States were represented.

Victoria has won 26 out of 41 races in which she took part, New South Wales only 7 out of 38. It is noticeable that neither State has won a race since 1912; the call of the surf in New South Wales, of lawn-tennis in Victoria, and of the week-end camp in both, has drawn away young oarsmen already disinclined for strict and long training. The Murray Bridge (South Australia) crew, on the other hand, has won four out of the six last races.

Australian Crews Abroad.—In April 1912 the first Australian crew to go abroad left in the *Osterley* to compete at the Olympic games at Stockholm. In order to qualify this crew to take part in the Grand Challenge Cup race at Henley they were required to be members of a single club; the Sydney Rowing Club was therefore established, and two Victorian oarsmen migrated to Sydney to join it. At Henley on 4 July the Australians defeated a crew from the Argonaut Club of Canada by a length and a quarter, on a course of 1 mile 550 yards, in 7 min. 4 sec.; next day a New College, Oxford, crew was defeated by a length in 7 min. 10 sec.; and on 6 July the Leander Club's crew was defeated by three-quarters of a length in 7 min. 6 sec. The Sydney Rowing Club's crew were J. A. Ryrie (New South Wales), 12.8; S. Fraser (Victoria), 11.11; K. Heritage (New South Wales), 12.2; T. C. Parker (New South Wales), 13.12; H. Hauenstein (New South Wales), 13.8; S. A. Middleton (New South Wales), 13.6; H. Ross-Soden (Victoria), 12.5; R. B. Fitzhardinge (New South Wales), stroke, 10.13; R. G. K. Waley (New South Wales), cox, 8.12. The same crew competed at Stockholm, except that Heritage was replaced by H. K. Ward (New South Wales). After winning comfortably against Gothenburg on the 18th in 6 min. 57 sec., the Australians were defeated in the second round by Leander by two-thirds

of a length in 6 min. 10⅘ sec.—a record for the 1½-mile course. The second crew to go abroad, a Murray Bridge crew, was not allowed to compete at Henley: as its members were working-men, the stewards decided that they could not be amateurs.

In 1918, soon after the armistice, rowing was revived in England by the Leander Club, and it was decided to hold in July 1919 a Henley Peace Regatta which should include races for oarsmen of the allied armies. The French Rowing Club had already advertised a race to be rowed on the Seine, open to allied soldiers. Australian representatives were collected and a sub-committee formed to take charge of the rowing. The committee—Major E. W. Tulloch, M.C., Lieutenant O. J. Wood, and Lieutenant H. Ross-Soden—were charged with the work of selecting and coaching. The race on the Seine was won by a New Zealand crew by eight feet; Australian crews did not compete. At Marlow regatta the Australian No. 2 crew competed, but New Zealand won by half a length in 4 min. 17 sec. The No. 2 crew were G. W. Mettam, 11.8 (bow); G. M. Penny, 11.8; E. J. Harrison, 11.12; A. V. Scott, 12.7; W. A. Audsley, 12.12; J. J. Cogle, 12.0; T. McGill, 12.9; H. R. Newall, 11.0; A. E. Smedley, 8.0 (cox). A four was entered in the coxswainless fours race with A. R. Robb, 11.8; H. Hauenstein, 13.10; S. A. Middleton, 13.6; F. A. House, 11.8 (stroke). In the first heat Australia and New Zealand met. From the start the steering troubled them both, and before long the Australians fouled the New Zealand boat and both crews stopped rowing. The umpire ordered a re-start at the place where the foul occurred, and allowed the Australian crew the advantage they had when the foul took place. The Australians won. In the second round they were defeated by a Thames crew. Two minor events were won later. The emergency men formed a crew for the clinker fours race, and the A.I.F. Wattle Club won the clinker eights race. At Walton regatta No. 2 crew won the senior eights on 28 June. At Henley regatta (held on 2, 3, 4, and 5 July) the great event was the King's Cup, in which both Australian crews competed; in the draw they rowed against one another, No. 1 winning by three-quarters of a length in 7 min. 31 sec.; in the second round they defeated Cambridge University by three-quarters of a length in 7 min. 24 sec. In the final, on 5 July, they won the cup by a clear length in 7 min. 7 sec., the fastest time for the whole regatta. H. H. Sharp (bow) and G. E. Rogers (stroke) entered for the Hambledon Pairs and defeated the Swann brothers of Trinity Hall, Cambridge, in their heat, but were defeated by the brothers Buxton of Third Trinity, Cambridge, in the final. At Henley the coxswainless four lost by fouling New Zealand. There were occasional changes in the two crews, but their final composition was:—*No. 1 Crew*—Sergeant A. R. Robb, 11.10 (bow); Lieutenant F. A. House, 11.12; Lieutenant T. McGill, 12.10; Gunner A. V. Scott, 13.0; Lieutenant H. Hauenstein, M.M., 13.9; Major S. A. Middleton, D.S.O., 13.6; Gunner G. W. Mettam, 11.12; Captain H. C. Disher, 11.1 (stroke); Sergeant A. E. Smedley, 8.1 (cox). *No. 2 Crew*—Lieutenant J. Howieson, 10.11 (bow); Sergeant G. M. Penny, 11.9; Sergeant E. J. Harrison, 12.2; Lieutenant H. A. White, 12.5; Major W. A. Audsley, D.S.O., 13.3; Corporal J. J. Cogle, 12.3; Gunner J. A. Begg, 13.1; Lieutenant H. R. Newall, 11.6 (stroke); Lieutenant O. J. Wood, 10.0 (cox).

The Australians also competed at the Inter-Allied games in Paris, entering a sculler and an eight; the eight won its heat, but was defeated in the final. The crew were:—Sergeant A. R. Robb (bow), Lieutenant H. R. Newall, Lieutenant L. S. Davis, Gunner A. V. Scott, Lieutenant T. McGill, Lieutenant F. A. House, Gunner G. A. Mettam, Captain H. C. Disher (stroke), Sergeant A. E. Smedley (cox).

Inter-university Races.—The first race between Australian universities was rowed on the Yarra on 20 December 1870, and was won by Melbourne in 31 min. 3 sec. The winning crew were T. C. Hope, 11.2; John Grice, 11.0; T. Colles, 10.2; D. Wilkie, 10.1. The Sydney representatives were A. Yeomans, 11.1; R. Teece, 10.10; E. Barton, 10.2; and E. A. Iceton, 10.1.

INTER-UNIVERSITY EIGHT-OAR RACE.

Year.	Course.	Winner.	Losers.	Time.
				m. sec.
1888	Yarra ...	Melbourne	Adelaide and Sydney.	13 5
1889	Port Adelaide	Adelaide	Melbourne ...	18 6½
1890	Yarra ...	Sydney ...	Melbourne ...	13 48½
1891	Parramatta	Sydney ...	Melbourne and Adelaide.	17 21
1892	Port Adelaide	Melbourne	Sydney and Adelaide.	17 21
1893	Yarra ...	Melbourne	Sydney and Adelaide.	16 5
1894	Parramatta	Sydney ...	Melbourne ...	17 9
1895	Port Adelaide	Sydney ...	Melbourne and Adelaide.	15 45
1896	Yarra ...	Adelaide	Sydney and Melbourne.	20 41
1897	Parramatta	Sydney ...	Adelaide and Melbourne.	18 8
1898	Port Adelaide	Sydney ...	Adelaide and Melbourne.	18 6¾
1899	Yarra ...	Melbourne	Sydney	23 2½
1900	Parramatta	Sydney ...	Adelaide ...	17 1
1901	Yarra ...	Sydney ...	Melbourne ...	16 48
1902	Port Adelaide	Melbourne	Sydney and Adelaide.	16 44
1903	Parramatta	Sydney ...	Melbourne and Adelaide.	15 36
1904	Yarra ...	Melbourne	Adelaide and Sydney.	18 1⅘
1905	Port Adelaide	Sydney ...	Melbourne and Adelaide.	17 37
1906	Parramatta	Melbourne	Sydney and Adelaide.	15 15
1907	Yarra ...	Sydney ...	Melbourne and Adelaide.	15 53
1908	Port Adelaide	Sydney ...	Melbourne and Adelaide.	15 45
1909	Parramatta	Sydney ...	Melbourne and Adelaide.	15 50
1910	Yarra ...	Adelaide	Sydney and Melbourne.	17 35
1911	Port Adelaide	Melbourne	Sydney and Adelaide.	16 29
1912	Parramatta	Melbourne	Sydney and Adelaide.	17 9
1913	Yarra ...	Melbourne	Sydney and Adelaide.	15 11⅕
1914	Port Adelaide	Melbourne	Adelaide and Sydney.	17 46⅖
	Interval during the war when no racing was done.			
1919	Parramatta	Melbourne	Sydney	19 34⅘
1920	Yarra ...	Adelaide	Melbourne, Brisbane and Sydney	17 30
1921	Brisbane ...	Melbourne	Brisbane, Adelaide and Sydney.	17 25
1922	Port Adelaide	Brisbane	Melbourne, Sydney and Adelaide.	17 22⅘
1923	Parramatta	Brisbane	Adelaide, Melbourne and Sydney.	17 43
1924	Yarra ...	Melbourne	Queensland, Adelaide, Tasmania and Sydney.	16 14
1925	Brisbane ...	Tasmania	Sydney, Queensland, and Melbourne.	18 1

A year later Melbourne again won on the Parramatta in 27 min. 25 sec. Since 1888 the universities have figured in annual eight-oar races, and since 1893 the prize has been a cup presented by 'old blues' of Oxford and Cambridge. Melbourne was the first to win the cup, which is retained for a year by the winning crew, a shield being added for each victory.

SCULLING.—The first sculling-race in Australia was rowed over a course from Balmain Point round Pinchgut and back, between T. McGrath and one Howard for £15 a side on 6 January 1851; McGrath won. George Mulhall, the first champion sculler of Australia, and R. A. W. Green, also figured in races with McGrath, but one of the most important events in connection with old-time rowing was decided on 27 February 1855 over a course from Fort Macquarie round Shark Island and back, between McGrath and an Englishman, John Deward; heavy boats were used, and the stake was £400. Deward won after a hard race by three lengths—time 45 min. 17 sec. On 22 April 1856 Green defeated Deward by several lengths in 45½ min. over a course from Balmain round Clark Island and back; the race was for the championship of Australia and £400. About this time several Englishmen figured prominently in Australian rowing, and Deward, James Candlish, James Edwards, and T. Day did a good deal towards introducing light boats—Edwards was the first to bring an outrigger from England. The first race rowed in outriggers took place over a 5½ mile course (Balmain-Clark Island) on 24 June 1856, Green defeating McGrath by two lengths in 44 min. The first race on the Parramatta course was rowed on 19 January 1858 between Green and Candlish from Shepherd's Point to The Brothers, for the local championship and £400; Green won in 23 min. 35 sec. After this it was decided that Green should represent Australia in a contest with the English champion; he sailed in the ship *Damascus* as carpenter's mate, and after waiting 12 months in England was given £200 to enable him to meet R. Chambers. The race was rowed from Putney to Mortlake on 16 June 1863. Green went off with a rush, and soon had a length's lead. In the first mile and a half the pace was fast, and the Australian pulled three strokes to Chambers's two, but was then seized with spasms, and Chambers won easily in 25 min. 35 sec; Green wanted another match, but Chambers refused to meet him. This defeat gave Australian sculling a set-back for some time. There have been a few races among professionals in the other States of the Commonwealth, but sculling has not thriven as in New South Wales.

Professional Championship of Australia.—George Mulhall held the championship until 1855 when he was beaten by Tom McGrath. In 1856, and again in 1859, McGrath was beaten by R. A. W. Green. In 1866 William Hickey took the title from Green, and retained it for some years—at one time he had 15 wins in succession. The championship then passed to M. Rush (1870), Elias Laycock (1875), Edward Trickett (1875), and Laycock again (1879). But Trickett's acquisition of the championship of the world (see below) overshadowed the minor title, and the professional Australian championship became comparatively unimportant. B. Thoroughgood, R. Tressider, and Harry Pearce have held it; Pearce defended the title on several occasions with success, but in October 1912 forfeited to Alf Felton rather than disturb his arrangements for a world's championship race with E. Barry.

Amateur Championship of Australia.—The first intercolonial amateur sculling race was decided on the Yarra on 11 March 1868, when Arthur Nicholls defeated H. Freeman of Sydney by six lengths. On 10 May 1884 W. G. Brett of Sydney defeated F. Wood of Melbourne on the Parramatta, and on 5 September successfully defended the title against A. F. Shortland of Tasmania on the same river. At Brisbane in 1892 M. J. Slack of Queensland beat W. Lambert of New South Wales. Three years later annual races for the championship were begun, and (except during the war) have been held regularly.

AMATEUR CHAMPIONSHIP.

Year.	Won by.	Other Competitors.	Time.
			m. sec.
1895	E. Powell (Vic.) ...	W. Lambert (N.S.W.), M. J. Slack (Q.).	20 22
1896	M. J. Slack (Q.) ...	J. L. Bannister (N.S.W.) W. McCormack, E. Powell (Vic.).	23 44
1897	E. Powell (Vic.) ...	A. Dennis (Q.), H. Lindgren (Vic.).	22 2
1898	A. Dennis (Q.) ...	M. J. Slack (Q.) ...	18 41½
1899	J. J. Daley(N.S.W.)	M. J. Slack (Q.) ...	...
1900	M. J. Slack (Q.) ...	C. Donald (Vic.) ...	23 23
1901	J. J. Daley(N.S.W.)	M. J. Slack (Q.), J. Lumsden (Q.).	19 22
1902	J. J. Daley(N.S.W.)	J. J. Fahey (S.A.) ...	21 12
1903	T. H. Bourke (Tas.)	P. C. Ivens (Vic.), J. J. Daley (N.S.W.), H. Brasch (Vic.).	...
1904	T. H. Bourke (Tas.)	M. J. Slack (Q.), P. C. Ivens (Vic.).	18 40¾
1905	T. H. Bourke (Tas.)	R. Evans (Tas.), P. C. Ivens (Vic.), H. J. G. Edwards (W.A.).	20 33¾
1906	P. C. Ivens (Vic.)...	W. Robinson (Tas.), P. C. Walsh (W.A.), H. J. Stephenson (W.A.).	21 36
1907	P. C. Ivens (Vic.)...	R. Green (N.S.W.) E. Jack (Tas.), W. Hill (W.A.).	20 54½
1908	H. Brasch (Vic.) ...	J. R. Towns (N.S.W.), W. J. Callaghan (Q.), E. Jack (Tas.).	17 50½
1909	J. R. Towns (N.S.W.).	F. Coverdale (Tas.), A. Dennis (Q.), A. Richards (Vic.).	16 5
1910	C. McVilly (Tas.)...	P. C. Ivens (Vic.), A. Briddle (N.S.W.).	16 19
1911	C. McVilly (Tas.)...	J. R. Towns (N.S.W.), H. E. Stephens (Vic.).	18 50
1912	H. Green (N.S.W.)	G. E. Rodgers (W.A.), F. Coverdale (Tas.).	16 45
1913	F. Coverdale (Tas.)	J. Fyte-Marr (Q.) ...	34 35¾
1914	C. McVilly (Tas.)...	J. Davis (Vic.), F. Thomas (S.A.).	17 11¾
1920	A. A. Baynes (Q.)	G. Westbrook (Tas.), J. Barton (Vic.), M. Goodsell (N.S.W.).	...
1921	G. Westbrook (Tas.).	J. Barton (Vic.), R. Neilson (N.S.W.).	...
1922	A. G. Bull (N.S.W.)	J. Barton (Vic.), A. Pitt (Tas.).	17 27¼
1923	A. G. Bull (N.S.W.)	M. Bradley (Tas.), I. McGorm (Vic.), A. Sadler (W.A.).	16 55
1924	J. Barton (Vic.) ...	— Rogers (W.A.), — Nimmo (Tas.), — Lorrimer (N.S.W.).	18 9½
1925	A. H. Cambridge (Vic.).	A. W. Cuthbertson (Tas.), H. E. Ricketts (S.A.), C. Lorrimer (N.S.W.), A. A. Baynes (Q.).	17 13½

In 1908 E. Jack, Tasmania, secured first place, but was disqualified for non-compliance with the amateur definition.

In 1913 C. McVilly of Tasmania won the Diamond Sculls at Henley.

The World's Championship.—At intervals from 1831 to 1868 races were held (usually on the Thames—Putney to Mortlake course) for the championship of England. In 1874 and 1875 J. H. Sadler won and retained the title,

and when Edward Trickett four times within 18 months defeated Laycock and Green on the Parramatta it was decided to send him to England to try conclusions with Sadler. On 27 June 1876 the two met on the Thames, nominally for the English championship; sliding seats were used, and this to some extent handicapped Trickett, who was not used to them. The race was started at 5.25 p.m. on a poor and slow tide with no wind. Sadler had the best of the start by nearly half a length, rowing 39 to Trickett's 37, but at the London Rowing Club's boat-house Trickett was level, at Craven Point two lengths, and at Rosebank four lengths ahead. Sadler spurted opposite the Crab-tree Inn, and again below Bull's Head, on each occasion coming within two lengths of his opponent and then dropping back to four. Trickett in the end won by four lengths in 24 min. 35 sec. When the news of the victory reached Sydney on 18 July there were scenes of wild enthusiasm, and on Trickett's return in November these were repeated, and a purse of £850 was made up for him. Almost immediately Michael Rush challenged him for what was thenceforth known as the championship of the world, but was beaten on the Parramatta on 30 June 1877. Rush (who used a fixed seat) held Trickett for a mile and then acquiesced in defeat, Trickett winning comfortably by 6-7 lengths. In the anniversary regetta of 1879 Laycock defeated Trickett for the champion belt of New South Wales, but this did not count for the world's championship. But during 1876-9 Edward Hanlan of Canada defeated many English and American scullers, and in 1880 challenged Trickett to meet him on the Thames; the race was rowed on 15 November 1880, and Hanlan after a hard fight for two miles drew away and won with ease; indeed, with very bad taste he stopped rowing several times to greet his friends. This so annoyed Laycock, who had gone to England and won several races, that he challenged Hanlan, and the race was fixed for 2 February 1881. The Thames, however, was frozen, and it was not till the 14th that the men were able to row, in weather still bitterly cold—Laycock's hands were so sore than he was scarcely able to row, and Hanlan had an easy victory. Trickett wanted another race, but did not get one till 1 May 1882, when he was again defeated. Hanlan's easy style, and the distance his boat ran between strokes, gave rise to the opinion that he must have some mechanical means for propelling his shell; the secret really lay in the fact that he had learned to get full advantage out of the slide. In 1884 Hanlan came to Sydney on the look-out for matches, and on 22 May defeated Laycock on the Nepean, then used for the first time for a championship race. He was next challenged by William Beach of Dapto, and after warm discussions a race was arranged for 16 August over the Parramatta course. A couple of days before the race the scullers met while training, and had a trial for some distance, Beach holding his own. On the day of the race Hanlan was excited, forced the pace from the start, and soon had a lead of a couple of lengths; at the mile he looked like the winner, but Beach rowed well, and won amid great excitement in 20 min. 28½ sec., a time rarely achieved in championship races on the Parramatta. Hanlan took his defeat badly. In 1885 Beach defended the title three times—against T. Clifford of Dapto on 28 February, Hanlan on 28 March, and Neil Matterson on 18 December; all these races were rowed on the Parramatta. In 1886 he visited England, on 1 September won the final of a sweepstake worth £1334, on the 18th defeated J. Gaudaur of St. Louis, U.S.A., and on the 25th defeated the Canadian Wallace Ross: these races were over the Putney-Mortlake course. In 1887 Hanlan paid a second visit to Australia, and on 26 November was defeated by Beach over the Nepean course by two lengths in 19 min. 55 sec. After this race Beach forfeited the title to Peter Kemp, who in 1888 had to defend it in four races; on 11 February he defeated Clifford, on 5 May Hanlan, and on 28 September Hanlan again. On 27 October, however, Henry Searle of Grafton, New South Wales, one of the fastest scullers the world has seen, secured the title, beating Kemp by about 200 yards. The next year Searle visited England and there defeated the Canadian W. J. O'Connor on 9 September on the Thames; returning to Australia, he died of enteric fever at Melbourne on 10 December 1889. On 25 April 1890 Kemp and Neil Matterson rowed for the title, and Kemp won, but on 15 December lost it to John McLean. J. Stanbury, who had defeated O'Connor on the Parramatta in June 1890, defeated McLean on

WORLD'S CHAMPIONSHIP.

Year.	Winner.	Loser.	Course.	Time.
				m. sec.
1876	E. Trickett ...	J. H. Sadler ...	Thames ...	24 35
1877	E. Trickett ...	M. Rush ...	Parramatta	—
1879	E. Trickett ...	E. Laycock ...	Parramatta	23 29
1880	E. Hanlan ...	E. Trickett ...	Thames ...	26 12
1881	E. Hanlan ...	E. Laycock ...	Thames ...	25 24
1882	E. Hanlan ...	R. W. Boyd ...	Tyne ...	21 25
1882	E. Hanlan ...	E. Trickett ...	Thames ...	28 0
1884	E. Hanlan ...	E. Laycock ...	Nepean ...	22 45
1884	W. Beach ...	E. Hanlan ...	Parramatta	20 28½
1885	W. Beach	T. Clifford ...	Parramatta	26 0
1885	W. Beach	E. Hanlan ...	Parramatta	22 51
1885	W. Beach	N. Matterson	Parramatta	24 11½
1886	W. Beach	J. A. Gaudaur	Thames ...	22 29
1886	W. Beach	W. Ross.....	Thames ...	23 5
1887	W. Beach	E. Hanlan ...	Nepean ...	19 55
1888	P. Kemp	T. Clifford ...	Parramatta	23 47
1888	P. Kemp	E. Hanlan ...	Parramatta	21 36
1888	P. Kemp	E. Hanlan ...	Parramatta	21 25
1888	H. E. Searle ...	P. Kemp	Parramatta	22 44½
1889	H. E. Searle ...	W. J. O'Connor	Thames ...	22 42
1890	P. Kemp	N. Matterson	Parramatta	21 13½
1890	P. Kemp	J. McLean ...	Parramatta	21 45½
1890	J. McLean ...	P. Kemp	Parramatta	22 13
1891	J. Stanbury ...	J. McLean ...	Parramatta	22 15½
1891	J. Stanbury ...	J. McLean ...	Parramatta	18 25
1892	J. Stanbury ...	T. Sullivan ...	Parramatta	18 27
1896	J. Stanbury ...	C. R. Harding	Thames ...	21 51
1896	J. A. Gaudaur	J. Stanbury ...	Thames ...	23 1
1901	G. Towns	J. A. Gaudaur	Rat Portage	20 30
1904	G. Towns	R. Tresidder ...	Parramatta	21 48½
1905	J. Stanbury ...	G. Towns... ...	Parramatta	19 47
1906	G. Towns	J. Stanbury ...	Parramatta	19 53½
1907	G. Towns	E. Durnan.....	Nepean ...	22 27
1907	W. Webb	C. Towns	Parramatta	20 45
1908	W. Webb	R. Tresidder ...	Wanganui	20 28
1908	R. Arnst	W. Webb ...	Wanganui	19 52
1910	R. Arnst	W Webb	Wanganui	18 15
1910	R. Arnst	G. Whelch ...	Akaroa ...	19 43
1910	R. Arnst	E. Barry	Zambesi ...	20 14?
1911	R. Arnst	H. Pearce	Parramatta	19 46
1912	E. Barry	R. Arnst	Thames ...	23 8
1912	E. Barry	E. Durnan ...	Thames ...	22 31
1913	E. Barry	H. Pearce	Thames ...	24 9
1914	E. Barry	J. Paddon ...	Thames ...	21 28
Interval during the war when no rowing was done.				
1919	A. Felton	E. Barry	Thames ...	25 40
1920	E. Barry	A. Felton	Parramatta	24 32
1921	R. Arnst	P. Hannan ...	Wanganui	22 38
1922	D. A. Hadfield	R. Arnst ...	Wanganui	19 46
1922	J. Paddon ...	D. A. Hadfield	Wanganui	19 15
1923	J. Paddon ...	D. A. Hadfield	Richmond	19 19
1924	J. Paddon ...	A. Felton	Brisbane	17 55
1924	J. Paddon ...	M. Goodsell ...	Richmond	17 10
1925	M. Goodsell ...	W. McDevitt	Clarence ...	22 20
1925	M. Goodsell ...	P. Hannan ...	Parramatta	21 31
1925	M. Goodsell ...	J. Paddon ...	Parramatta	22 50

28 April 1891, and retained the title from T. Sullivan of New Zealand (2 May 1892) and C. R. Harding of England (13 July 1896), but on 7 September was defeated by Gaudaur. For five years Gaudaur was undefeated; but the Australian George Towns, who won the championship of England from W. Barry on 1 May 1889, challenged him, and after two years met him on 7 September 1901 at the Lake of the Woods in Canada, and defeated him easily. Returning to Sydney, Towns was challenged by Richard Tressider, and beat him by 20 lengths over the Parramatta course on 30 July 1904. Stanbury, who had not rowed for a number of years, next challenged Towns, and beat him by two lengths on 22 July 1905; Towns on 28 July 1906 regained the championship, and on 2 March 1907 defeated a Canadian challenger, Edward Durnan, on the Nepean by four lengths. A couple of months later Towns forfeited the title to his brother Charles, who was beaten on 3 August in the same year by William Webb, the first New Zealander to hold the championship. Webb defeated Tressider on the Wanganui on 25 February 1908, but lost a race to another New Zealander, Richard Arnst, by ten lengths on 15 December. Arnst held the title against Webb (21 June 1909), G. Whelch (5 April 1910), the Englishman Ernest Barry (18 August 1910, on the Zambesi River), and Harold Pearce (29 July 1911), but was defeated by Barry on the Thames on 29 July 1912; Barry held it against Durnan (14 October 1912), Pearce (21 July 1913), and J. Paddon (7 September 1914), after which the war interrupted all sport. In 1919 the title was again challenged, the Australian A. D. Felton defeating Barry on 27 October; Barry came to Australia in 1920 and defeated Felton on the Parramatta on 28 August. The title then fell into abeyance, but in 1921 Arnst emerged from his retirement and defeated Hannan on the Wanganui; on 5 January 1922 D'Arcy Hadfield defeated Arnst on the same river, and on 18 April in the same year lost the title to Paddon. This brought the championship back to New South Wales, and Paddon maintained the title against Felton on the Brisbane River and against Hadfield and Major Goodsell on the Richmond; he then retired, Goodsell assumed the title, and in 1925 maintained it against W. McDevitt (on the Clarence), P. Hannan (on the Parramatta), and Paddon himself (also on the Parramatta).

J.V.C.-B.

Royal Societies. See SOCIETIES, LEARNED.

Rubiaceae, a large family of trees, shrubs, or herbs (rarely climbers), dispersed throughout the globe; there are 147 Australian species. The calyx is entire or toothed; petals 4-5 lobed; fruit a capsule, berry, or nut; leaves opposite or whorled. The largely tropical genera *Ixora* and *Randia* have indigenous representatives which supply a useful timber. *Coelospermum reticulatum,* a scrambling shrub, has a thick bark formerly used as a dye. *Nertera depressa* is a prostrate alpine shrub with tiny red berries, often found in bush-houses. See CANTHIUM, COPROSMA, GUETTARDA, MORINDA, TIMONIUS.

Rubus, a world-wide genus of the family Rosaceae, consisting of scrambling and usually prickly shrubs, to which the ubiquitous Blackberry (*R. fruticosus*) belongs. Of the species indigenous to Australia two are endemic. The calyx-tube is short, open, 5-lobed; petals 5; fruit the well-known head of succulent drupelets; leaves deeply lobed or divided into distinct leaflets. *R. rosaefolius* is one of the native raspberries, the 'neram' of the aborigines. It bears a fruit resembling the raspberry, but is rather insipid and has a trace of astringency. *R. Moorei* is a powerful scrambler, which impedes traffic in the eastern coastal scrubs.

Ruby. See GEMSTONES and MINERALOGY.

Rue Spleenwort. See FERNS.

Rum, TRAFFIC IN, was the cause of most of the evils which afflicted the colony of New South Wales from the departure of Governor Phillip till 1816, when it was ended by an order forbidding government officials to engage in commercial transactions. (In the early days spirits of all kinds were loosely spoken of as 'rum.') The scarcity of coins (see CURRENCY) compelled the use of a popular and easily divisible medium; wages and government rewards were paid in spirits; a man sold his wife for four gallons of rum; part of the price for the erection of the first church (see CHURCH OF ENGLAND) was paid in rum, and the first theatre accepted payments in rum or kind (see DRAMA).

Phillip quickly realized the danger of free-trade in spirits, but he was compelled to import them to supply the appointed ration to the New South Wales Corps. On 10 January 1792 Dundas sent 9278 gallons of rum, instructing Phillip that the more deserving convicts should have an allowance; on 15 May he sent port wine for the governor to sell to officers—civil and military—at cost price. Phillip rigidly controlled the traffic, but a fortnight after he left New South Wales Major Grose (q.v.) allowed his officers to buy 7597 gallons of spirits from the American ship *Hope*; this purchase marks the beginning of the 'rum currency.' In February 1793 Grose reported to Dundas that he had permitted the commissary to sell spirits to the amount of £405 'of which some small part had been applied to the purchase of stock.' Dundas was alarmed, and ordered him to appoint inspectors to regulate the traffic. Phillip had forbidden the convicts to exchange their produce for spirits, but Grose allowed the practice, and many of them refused any other form of payment. Though Paterson (q.v.), who succeeded Grose, forbade the sale of spirits to convicts, he took little care to see the order obeyed. Ships arriving in Port Jackson were boarded by officers, who purchased the spirits on board. The monopoly so gained enabled them to make enormous profits, and the high prices incited the settlers to set up private stills. In December 1793 a settler named Webb imported a still and converted his grain into spirits, which he sold at 6s. a quart; his example was followed by many others, till the grain shortage became acute. By this time the home government was thoroughly alarmed, and Hunter arrived in 1795 with orders to put down all traffic in spirits and to see that none should be landed without his consent. On 23 January 1796 he issued an order prohibiting stills, and to prevent the indiscriminate sale of rum he instituted the granting of licences to persons of approved character. A later order proclaimed that anyone selling spirits without a licence would incur the penalty of having his 'house pulled down as a public nuisance.' At first ten licences were granted, and many stills were broken up; but the prevailing drunkenness showed that more rum was coming into the country than the permits allowed. On 18 June an order forbade payment in spirits for 'grain and other goods,' and licensed publicans were warned that, if found guilty of the practice,

they would forfeit their licences and have their houses pulled down. But despite these precautions the traffic grew.

Hunter admitted that as a medium of exchange rum had its advantages, since 'much work will be done by labourers and artificers and others for a small reward in this article which money would not purchase.' To circumvent the officers, he placed a guard on board all ships that came in; but in spite of his strenuous efforts he was unsuccessful, since Grose had put the direction of the whole of the concerns of the colony into the hands of the military. In July 1797 a refusal to allow spirits to be landed brought him into open conflict with the officers, and he suggested to the home government that an import duty should be imposed. Anonymous letters were circulated accusing him of conniving at the traffic, and though he offered a reward of 20 guineas and emancipation to any convict who revealed the author's name, he was never found. In 1798 stricter injunctions were received from Portland, who promised to instruct the transportation board to prevent the landing of spirits in New South Wales without a permit. He also asked Dundas to prevent the sending of spirits from India. The worst effects were seen among the settlers, some of whom were ready to barter a whole crop for a few gallons of rum. In February 1798 they petitioned Hunter against the dealers, who sold for 15s. a bottle of spirits usually purchasable at from 5s. to 10s. a gallon. Thomas Arndell and Samuel Marsden were appointed to enquire into the matter. Their report stated that the liquor traffic had ruined most of the settlers who took up land in Phillip's time.

In August 1798 Hunter reduced the number of licences to eight for Sydney, three for the Hawkesbury, and four for Parramatta. In September orders arrived instructing him to prevent traffic in grain, live stock, and spirits by the officers and government officials. In February 1799 Portland wrote of an anonymous letter which had been received, accusing the governor of irregularities, and a refutation of the charges was asked for; at the same time Colonel Paterson, then in England, was ordered to rejoin his regiment and stop the traffic among his officers. In January the snow *Thynne*, sailing under Danish colours, arrived from Bengal with 9106 gallons on board. As the ship had been chartered by the officers, Hunter was powerless to prevent the spirit from being landed. Hunter's reply to Portland's letter did not convince the home government, which exculpated him from any connection with the rum traffic, but thought he had been lax in enforcing his orders. He was recalled, and Philip Gidley King (q.v.) appointed.

King arrived on 15 April 1800, and in May wrote to Lord Mornington, governor-general of India, asking that the exportation of spirits from India to Australia should be prohibited. Colonel Paterson was commanded to publish the stringent orders of the home government and to court-martial any officer who should land spirits without a licence from himself. On this, Balmain and D'Arcy Wentworth (q.v.) wrote offering to sell to the government, at 20s., 4400 gallons of rum which they had purchased for 10s. a gallon before the issue of the proclamation. King could not purchase, but allowed the spirit to be sold at the price named, insisting on a strict account being kept of the whole transaction. Among his general orders of 10 October 1800 is one imposing a duty 'For the jail or other public works—spirits 1s., wine 6d., and beer 3d. a gallon, to be levied by the naval officer and clerk assessor.'

In October 1800 orders were given regarding the issue of licences, and a fine of £10 was imposed for the sale of liquor without a licence; spirits were not to be sold between the beating of the 'taptoo' and noon the following day, nor during divine service, under penalty of £5—to be divided between the informer and the orphan fund. The fee for a licence was £3 2s. 6d., and the usual sureties must be given. Directions from England stopped the export of spirits from India, but English and American vessels were constantly calling. King wrote to the American minister in London asking him to warn his government of the restrictions laid upon spirits, and also asked Portland to inform the transport board that he would not allow more than 500 gallons to be landed from any vessel. Between January and June 1801 the *Folinsbe*, with 13,000 gallons of spirits and 15,000 gallons of wine, the *Missouri*, with 7000 gallons each of spirits and wine, and the *Harrington* and *Matilda* with 12,000 gallons of spirits between them, were turned away by the governor. For this he was soundly hated by the military; but, backed by the home government, he enforced his orders. The transport board compelled owners of ships to enter into a bond to obey the governor, and inserted in the charter-party a clause forbidding them to land spirits without his permit. To counteract the desire for spirits, King encouraged the manufacture of beer, for which in 1802 Lord Hobart sent supplies of hops, hop-plants, and brewing utensils. In May 1804, when the government brewery was opened, a punitive duty of £5 was imposed on every 100 gallons imported. Because of the severity of his restrictions, King was freely lampooned (see 'PIPES'), and when he asked the home government to institute an enquiry, his request was answered by his recall and the appointment of Bligh (q.v.).

Bligh's reign was one long fight, and the vigorous measures he took against the traffic were one of the causes of his deposition, which was popularly known as 'The Rum Puncheon Rebellion.' Foveaux thought that with less restriction the evil would cease, and, in spite of the protests of the settlers, the monopoly continued until Governor Macquarie arrived in 1809. Macquarie raised the spirit duty to 3s. a gallon and reduced the licences from 75 to 20, with a proportionate reduction in the smaller towns and districts. In 1810 an order promised severe punishment for the selling of liquor without a permit, and the port regulations (October 1810) forbade ships to 'send on shore wine, beer or strong liquors without special permission from the governor or his secretary.' Spirits landed elsewhere than at the hospital wharf were considered as smuggled, and were confiscated. Macquarie was, however, forced to use rum as payment; the clearing and making of George-street between Bridge-street and Brickfield Hill was paid for with 400 gallons; the final instalment due to John O'Hearne for rebuilding the bridge facing Sydney Cove was paid with 660 gallons; Macquarie bought a house for 200 gallons; and the contractors for the Sydney Hospital were paid with a monopoly over imports of rum for three years (see HOSPITALS). But though Macquarie used rum in these transactions, he strictly enforced the regulations he

had made. By increasing the quantity of coin in 1813 (see CURRENCY), he gave the first effective blow to the traffic. In 1819 the home government conceded distillation, and by 1829 the importation of 'rum' had ceased.

Rümker, CARL LUDWIG CHRISTIAN STARGARD (1788-1862), born in Mecklenburg on 28 May 1788, served in the British navy in 1807-17 and in 1819-20 was superintendent of the nautical school at Hamburg. In 1821 he was brought to Australia by Sir Thomas Brisbane as his private astronomer, and placed in charge of the observatory at Parramatta (see ASTRONOMY), where on 2 June 1822 he rediscovered Encke's comet; for the achievement he was awarded a medal and £100 by the Royal Society. Brisbane, however, grew dissatisfied with his work and his private behaviour, and in June 1823 he retired to his farm near Picton, but from July 1824 to December 1825 contrived to continue his astronomical studies. In 1826 the Royal Society proposed that an arc of the meridian should be measured in New South Wales, and Darling (Brisbane having left the colony) gave Rümker charge of the Parramatta observatory for this work; on 4 September he discovered a new comet in the constellation Orion. In January 1828 Darling appointed him government astronomer, but in December he threw up the appointment and returned to Europe to become director of the Hamburg observatory. In 1854 he was awarded the gold medal of the Royal Astronomical Society for his work, which included a catalogue of 12,000 stars made in 1846-52. In 1857 he retired from active work to live at Lisbon, where he died on 21 December 1862. His name is stated in various forms. In Australia he was usually known as Charles Stargard Rümker, but his land was granted to 'Charles Luis Rümker,' and his award for Encke's comet was to 'P. Karl Rümker.'

Rural Bank of New South Wales, The. See SAVINGS BANKS.

Rusden, GEORGE WILLIAM (1819-1903), born at Leith Hill Place in Surrey on 9 July 1819, in 1834 migrated to New South Wales, and became at first a jackeroo and later on a journalist. In 1849 he was appointed government agent for national schools in the Port Phillip district, and in 1850 was transferred to Moreton Bay. In 1851, when Victoria separated from New South Wales, he was made chief clerk in the colonial secretary's office at Melbourne, and in 1852 became clerk to the executive council. In 1856, when Victoria acquired two houses of parliament, he was promoted to be clerk of parliaments. In 1853-60 he was a member of the Victorian board of education, and was one of the original members of the university council. In 1874 he determined to write large-scale histories of New Zealand and Australia, and in 1882, having retired on a pension, went to England, where both books were published in 1883. The *History of New Zealand* involved him in a libel action and the payment of £5000 as damages to John Bryce, a member of the New Zealand legislature. In 1893 he returned to Melbourne, published there revised editions of his two histories in 1895-7, and died at South Yarra on 23 December 1903.

Ruse, JAMES (1760-1837), born at Launceston in Cornwall, was on 29 July 1782 convicted at Bodmin assizes on an unknown charge, and sentenced to seven years' transportation. Coming to Australia in the First Fleet, he completed his sentence in 1789, and in November of that year Phillip had an acre of ground cleared at Rose Hill, a hut built on it, and Ruse installed by way of experiment 'in order to know in what time a man might be able to cultivate a sufficient quantity of ground to support himself.' Ruse was picked out for his consistent industry, and promised a grant of 30 acres if he behaved well. His methods of cultivation were primitive, but more efficient than those of Phillip's other farm-hands:—'Having burnt the fallen timber off the ground' he told Watkin Tench, 'I dug in the ashes, and then hoed it, never doing more than eight or perhaps nine rods a day, by which means it was not like the government farm, just scratched over, but properly done. Then I clod-moulded it, and dug in the grass and weeds; this I think almost equal to ploughing. I then let it lie as long as I could, exposed to air and sun; and just before I sowed my seed I turned it all up afresh.' In May 1790 he sowed an acre and a half of bearded wheat, and in August half an acre of maize; he also made a small kitchen-garden. In February 1791 he reported that he was fully able to maintain himself, and in December took over also the maintenance of his wife and child. The deed of grant for the promised 30 acres—the first land grant issued in Australia—was signed on 22 February 1791. This land, which was named 'Experiment Farm,' lies within the present town of Parramatta, near Harris Park railway-station.

In 1793 Ruse sold his farm to John Harris (q.v.) and in January 1794 began to clear another 30-acre grant near Mulgrave-place on the Hawkesbury. Here he lived for many years; in 1810 he was a constable at Windsor, probably leaving his young son to manage the farm. He died on 5 September 1837, and was buried in St. John's churchyard at Campbelltown, where his tombstone, bearing the following epitaph, is still to be seen—

> My mother Reread Me Tenderley
> With Me She Took Much Paines,
> And when I Arivd In This Coelney
> I sewd The Forst Grain, And Now
> With My Hevenly Father I Hope
> For Ever to Remain.

Russell, ALEXANDER RUTHERFORD (1825-1886), born at Muthill in Perthshire, Scotland, in 1825 and educated at the Edinburgh high school, worked in a merchant's office until 1844, when he determined to devote himself to the ministry, and after a good deal of indecision entered the Church of England in 1846. For two years he studied at the university of Edinburgh and at Trinity College, Dublin, in 1850 was ordained deacon, and priest in 1851. In 1854 he was appointed curate of a cathedral to be erected at Adelaide, and arrived in South Australia in August 1854. This cathedral was never built (see CHURCH OF ENGLAND), and Russell was given parochial work. In 1857 he was made canon and rural dean, in 1869 dean of the cathedral, and in 1878 vicar-general of the diocese, which he administered during the interregnum between Bishop Short and Bishop Kennion. He was a close friend of Frederick Denison Maurice, who in 1869 offered him the succession to his chapel of St. Peter's in Vere-street, London. He died at Adelaide on 20 May 1886.

A.D.A.

Russell, HENRY CHAMBERLAIN (1836-1907), born at West Maitland on 17 March 1836 and

educated at the West Maitland grammar school and the university of Sydney (B.A., 1858), joined the staff of the Sydney observatory in 1859 and in August 1870 was made government astronomer. His work in this capacity is discussed under ASTRONOMY, and his meteorological work under METEOROLOGY. He was interested in technical education, which he did much to further in New South Wales; in 1875-1907 he was a member of the university senate, and in 1891 vice-chancellor; he was also first president of the Australasian Association for the Advancement of Science (1887), and four times president of the Royal Society of New South Wales. In 1886 he was made a fellow of the Royal Society of London. He resigned his post at the observatory in 1905 and died at Sydney on 22 February 1907. A prolific writer, his most notable publications are *The Climate of New South Wales* (1877), many volumes of *Meteorological Observations* (1871-8) and *Rain and River Observations* (1880-8). (C.M.G., 1890.) J.V.C.-B.

Russell, HENRY STUART (1818-1889), was born on 10 March 1818 and educated at Harrow and Christ Church, Oxford. He played in the Harrow eleven in 1837-8, and in the Oxford eleven of 1839, but he left the university without taking his degree. He arrived in Sydney early in 1840, with letters of introduction including one to Governor Gipps. Two of his old school-fellows, Pemberton and Arthur Hodgson (q.v.) were interested in properties in the territory that afterwards became Queensland, and Russell, who met them in Sydney, went with them to the Darling Downs, where he formed a cattle-station at Cecil Plains, the only cattle-station at that time on the Downs. Russell was a man of adventurous character, and was probably the first white man to cross the dividing range to the Burnett River; he mistook it for the Boyne which Oxley discovered in 1823. In May 1842 Russell accompanied Andrew Petrie (q.v.) in a whaleboat along the coast, and entered a river which was afterwards named the Mary, in honour of Lady Mary Fitz Roy. On that journey they discovered James Davis, the convict who had been with the blacks for some years (see WILD WHITE MEN). In November 1852 Russell became member for the Stanley Burroughs in the legislative council, and lived for three years in Brisbane, where he built the original Shaftson House. Then he went to Sydney, and purchased a property at North Shore known as The Rangers. Early in 1889 he returned to England, and died suddenly at Ottery St. Mary in Devonshire on 5 March 1889. In Oxford and Cambridge *Scores and Biographies* it is stated that Russell entered the Queensland public service in 1866 and was also a member of the Queensland legislative assembly. Neither of these statements is correct.

F.McK.

Russell, SIR PETER NICOL (1816-1905), born at Kirkcaldy in Fifeshire, Scotland, on 4 July 1816, came to Hobart with his father, an engineer and ironmoulder, in 1832. In 1839 he settled in Sydney and with his two brothers established in 1842 the firm of P. N. Russell and Company, blacksmiths, engineers, and founders, which in the 1850s was much occupied with railway-construction and became one of the most important businesses in Australia. In 1867 P. N. Russell retired from active business to settle in London, where he represented the firm. In 1875 the employees demanded so many concessions that the business was closed down. In 1896 P. N. Russell, at the instigation of Anderson Stuart (q.v.), gave £50,000 to endow the department of engineering at the university of Sydney, and in 1904 another £50,000 on condition that the government gave £25,000 to erect new buildings for the department. He died in London on 10 July 1905. (K.C.M.G., 1904.)

Rutaceae, a large family widely diffused over the hot and temperate regions of the world. In Australia its 26 genera and 232 species range from the coast to the interior. The flowers are regular, with 4-5 sepals and petals; fruits separating into 2-valved capsules (*Boronia*, etc.) or with carpels united into a succulent fruit, as in the orange or lemon; leaves mostly opposite, marked with glandular, pellucid dots which contain a highly perfumed essential oil. Many of its genera (e.g. *Asterolasia, Boronia, Philotheca*) are highly decorative shrubs. The family derives its name from the common Rue of Europe (*Ruta graveolens*). *Philotheca* is a small endemic genus of heath-like undershrubs with pink to red flowers. *Bosistoa* is limited to one (endemic) species, *B. sapindiformis* (Union

Bosistoa sapindiformis.

Nut). It has a close-grained timber, beautifully marked, easily wrought and suitable for cabinet-work. *Asterolasia* is an endemic genus of shrubs with yellow flowers, which, like the leaves and branches, are clothed with woolly star-like hairs. The indigenous species of *Melicope* are shrubs or small trees with tripartite leaves. *M. erythrococca* has a rather heavy wood, somewhat like boxwood, with a pretty grain of a delicate tint. *Pentaceras australis*, the only representative of its genus, has handsome foliage, the slender drooping leaves, with 7-11 leaflets, attain-

ing a length of 1 foot. It has spreading white flowers and 5-horned, or winged, fruits. *Acronychia* is a genus with succulent fruits and white or yellowish flowers. The timber of *A. Baueri* (Brush Ash) is excellent for mallet- and chisel-handles. *A. laevis* (Yellow-wood) has a light close-grained wood. *Medicosma Cunninghami* is a small tree with a light yellow wood, suitable for cabinet-work.

See ATALANTIA, BORONIA, CITRUS, CORREA, ERIOSTEMON, GEIJERA, MURRAYA, PHEBALIUM, ZIERIA.

Rutherford, JAMES (1827-1911), born at Erie in the United States on 22 August 1827, in June 1852 migrated to Victoria; on the Bendigo diggings he was unsuccessful, but obtained in Melbourne contracts for wood-cutting, and on his first holiday visited Brisbane. Returning overland to Melbourne he interested himself on the way in horse-dealing, and towards the end of the fifties acquired an interest in the coaching business of Cobb and Co. This business had been started in Victoria in 1853 by four of his countrymen—Freeman Cobb, John Murray Peck, James Swanton, and John Lamber—who imported several American coaches suspended on leather springs, better adapted for the rough roads of the Australian bush than the local coaches then in use. At that time the goldfields were badly served with transport, and the coaching lines of Cobb and Co. soon returned a handsome profit. The original partners sold out their interests, and the business had already changed hands four times when it was taken over by a company consisting of James Rutherford, Alexander William Robertson, John Wagner, Walter Russell Hall, William Franklin Whitney, and Walter Bradley. Rutherford reorganized and extended the Victorian services and secured a monopoly of the mail contracts. In 1861 he advocated the extension of the business to New South Wales, but it was opposed by his partners; when, however, the Lambing Flat gold-rush stirred up business in New South Wales, it was agreed to open up there, and Rutherford, Hall, Whitney, and Bradley came over. Rutherford fixed his headquarters in Bathurst (which remained for 50 years the head office of the firm), and sent an 'imposing cavalcade' of ten coaches, 103 horses, and two feed-waggons overland from Bendigo to open the service. The business was extended to Queensland in 1865, when H. Barnes, one of the company's road-managers, put a coach on the Brisbane-Ipswich run; by January 1867 Cobb and Co.'s coaches were running from the Brisbane centre to Ipswich, Toowoomba, Warwick, Dalby, Condamine, and Roma, and at the end of the year to Gympie, where a gold-rush had set in. The Queensland business was formed into a separate company, with Rutherford in control. By 1870 Cobb and Co. in the three eastern colonies were harnessing 6000 horses per day, their coaches were travelling 28,000 miles per week, their annual pay-sheet exceeded £100,000, and they received £95,000 per annum in mail subsidies.

In 1871 the businesses were separated, Robertson and Wagner taking the Victorian assets, and Rutherford, Hall, Whitney, and Bradley those of New South Wales and Queensland. Bradley left the firm in the middle seventies, Hall retired in 1880, and Whitney died in 1893, so that Rutherford at the time of his death was the sole surviving partner of the corporation. Robertson and Wagner, too, predeceased Rutherford.

As new railways were constructed, the coach-routes were pushed farther out to serve the back-country, and were partly instrumental in opening up these areas for settlement by establishing reliable communication between them and the centres of supply; many half-way houses depended on the coaching traffic for a livelihood, and disappeared as the coaches were withdrawn. During the eighties the greatest development of the business was in Queensland, where before the end of that decade 4000 miles of coach-route were controlled by Cobb and Co. The company's service was famous not only for its regularity and speed, but also for the skill and popularity of the drivers. In 1862 the coach from Forbes to Bathurst, carrying a large consignment of gold under the protection of mounted police, was stuck up by bushrangers at Eugowra Rocks; the driver, Jack Fagan, had a bullet through his hat, and two police were wounded before the booty was secured (see BUSHRANGING). The coaching service was gradually supplanted by rail and motor transport, but not until 1924 was the last coach of Cobb and Co. taken off the Yeulba-Surat (Queensland) run. This coach is now on exhibition in the Queensland Museum, and another has been preserved in the grounds of W. C. Wentworth's former residence at Vaucluse near Sydney. Rutherford was not connected with the firm that traded under the name of Cobb and Co. in Western Australia.

The interests of the firm were not confined to the coaching business. As early as 1864 they bought the well-known station Buckinguy in the western district (which was still held by Rutherford at his death) and other properties in New South Wales and Victoria. They also developed the jarrah trade between Western Australia and India, and were contractors for the Glen Innes to Tenterfield railway-line, which involved them in heavy losses. Rutherford gradually acquired for himself extensive pastoral properties in New South Wales and Queensland, and imported prize stock on a large scale; he also founded and financed the Eskbank iron-works at Lithgow (see IRON), which were ultimately sold to G. and C. Hoskins. On his way back from an inspection of his Queensland properties he died at Mackay in Queensland on 13 September 1911.

See W. Lees's *Cobb & Co. Ltd.*, and Henry Lawson's 'The Lights of Cobb & Co.' in *Winnowed Verse.*

Rutile. See MINERALOGY.

Ryrie, SIR GRANVILLE DE LAUNE, was born at Michelago in New South Wales on 1 July 1865 and educated at The King's School, Parramatta. He was elected by Queanbeyan to the legislative assembly of New South Wales (1906-9), was member for North Sydney in the Commonwealth house of representatives (1911), appointed honorary minister in the Hughes cabinet (1920), and subsequently became assistant minister for defence. Always keenly interested in the volunteer movement, he joined the 1st Australian horse (2nd lieutenant, 1898; lieutenant, 1899; captain, 1901; major, 1903; lieutenant-colonel, 1904; colonel, 1914; brigadier-general, 1914; major-general, 1919), and was for seven years in command of the 3rd light horse regiment, New South Wales. He served with the mounted rifles in the South African war (1900-1) and was severely wounded. In that campaign he disclosed the conspicuous personal bravery and capacity for leadership which distinguished his conduct in the war of 1914-18. Enlisting at the

outbreak of hostilities, he was appointed to command the 2nd light horse brigade, and served with it (dismounted) during the greater part of the Gallipoli campaign. He afterwards led the same unit throughout the operations in Palestine, commanding the vanguard in the first advance in strength across the Suez Canal into Sinai. As a leader of mounted men he excelled in his extraordinary sense of ground and in horsemanship.

He is one of the most complete bushmen in Australia, and this capacity was reflected in his conduct of all mobile operations in the war, in which he proved a most crafty and dependable leader, and stood high in the affection of the light horsemen. He was twice wounded. In 1919 he was promoted to the rank of major-general and for some time commanded the A.I.F. in Egypt. (C.M.G., 1916; C.B., 1918; K.C.M.G., 1919.)

H.S.G.

S

Sail-fishes. See SWORD-FISHES.

Sailor-fish. See DEMOISELLES.

St. John's Wort, a deep-rooted perennial (*Hypericum perforatum*) widely distributed and comparatively innocuous in Europe, developed into a serious pest when it was introduced into the less used and tended pastures of North America. It was brought from England to Victoria as a garden plant over 50 years ago, soon became accustomed to its new environment, and spread so rapidly that more than 150,000 acres in that State are now infested with it. Its spread in New South Wales and South Australia began later and is less extensive, but the danger from it is just as great. It is a prolific seeder and spreads rapidly from the roots as well; when firmly established, it excludes all other vegetation from the soil. Above ground the plant forms short runners throwing out erect stems about 2 feet high; below ground the roots penetrate from 2 to 4 feet, and sometimes deeper. The leaves, which are green with a bluish-green tinge, when held to the light disclose semi-transparent dots due to oil-glands; the bright-yellow flowers are 5-petalled, appear in terminal clusters, and contain a fluorescent juice—their edges sometimes show black dots. The Australian plant is narrower-leaved than the European and is probably not so rich in essential oils.

Powerful medicinal properties have been ascribed to the European plant, and the extracted oil was at one time largely used for wounds, and rheumatism; in still earlier days the plant was used as a charm against witchcraft and malignant influences. Its active principle, when absorbed into the system, renders unpigmented skin peculiarly sensitive to sunlight, setting up a feverish condition and inducing intolerable itching. The efforts of an affected animal to gain relief result in bleeding, swelling, and raw, excoriated surfaces. There is also a reaction on the nervous system; if feeding on the wort be persisted in, death may supervene. All kinds of stock are affected. Their removal to clean pastures will effect recovery, but the loss of condition and the damage to wool and hide are more permanent.

Ordinary methods of cultivation are worse than useless, since they only stimulate the plant and disperse the seed; a system of intense cultivation, with rotation of crops and deep ploughing, would keep it under control and might in time suppress it. 'Salting' has been found the most reliable method of eradicating the wort; where thick infestation occurs the cost is prohibitive, but for isolated plants or sparsely infested lands no better method is known. The salt is deposited in a small ringed hollow surrounding the plant, and is usually applied in the spring—sometimes after a burning-off. Arsenic sprays have been used with fair success. A natural enemy of St. John's wort is dodder, a twining parasitic plant of the convolvulus family, with very little root, which finds its host in either lucerne or St. John's wort. It is, unfortunately, itself a proclaimed noxious weed. On very lightly infested country, sheep are helpful, checking the development of the weed by eating off the green shoots as they appear. Eaten with ordinary grasses, and forming only a small proportion of the diet, it has shown no harmful effects.

St. John's wort must not be confused with Stinkwort (*Inula graveolens*), also a noxious weed proclaimed throughout the States. The former is a far more dangerous pest; its marked vitality and relentless growth make suppression more difficult than that of any other Australian weed. See NOXIOUS PLANTS. A.H.Ch.

Salmon. Attempts have been made to introduce the English Salmon (*Salmo salar*) into Tasmania, but the fish failed to establish itself. An excellent account of these attempts and their results is given by P. S. Seager and R. M. Johnston in the *Proceedings* of the Royal Society of Tasmania for 1888. There is no indigenous salmon in Australia, but several marine fishes having little resemblance to, and no affinity with, the family Salmonidae, are commonly called salmon by fishermen. See AUSTRALIAN SALMON and THREADFIN.

A.R.McC.

Salomons, SIR JULIAN EMANUEL (1836-1909), born at Edgbaston near Birmingham in England on 4 November 1836, in 1853 migrated to Sydney and obtained employment as a stock-broker's clerk, but displayed such remarkable ability at a debating club attached to the Synagogue that his co-religionists provided funds to send him back to England to study law. In 1858 he entered at Gray's Inn, and in 1861 was called to the bar there, returning at once to Sydney to practise. He devoted himself at first to criminal cases, and made a reputation in the notorious Bertrand case, which he fought in such a way as to procure for the prisoner a commutation of the death sentence; in after years he preferred the civil courts, and obtained a large share of crown business. So great, indeed, was his fame as a pleader that when he returned from visits to Europe briefs were sent to meet him at Colombo. In 1869 he entered politics as solicitor-general in the second Robertson ministry (which was absorbed in the fifth Cowper ministry), and sat in the legislative council from August to December 1870 as representative of the government. He resigned from the council in February 1871, but was reappointed in March 1887 as vice-president and representative of the fourth Parkes ministry; he left office with Parkes in January 1889, but broke with his leader on the question of Australian federation (which Salomons strongly opposed) and came

back to office in October 1891 as vice-president of the council in the third Dibbs ministry. In 1899 he left the council to become agent-general for his colony in London, but resigned that office also in 1900, and spent the rest of his life in Sydney. In 1886 he was chosen to succeed Sir James Martin as chief justice of New South Wales, but discovered that his appointment was distasteful to several puisne judges, and resigned before being sworn in. In 1899 he was made a bencher of Gray's Inn. He died at Sydney on 6 April 1909. (Kt. Bach., 1891.)

Salt is obtained in South Australia by scraping the beds of shallow lakes during the summer, and at Geelong in Victoria and elsewhere by the evaporation of sea-water. It is then refined, table-salt and the grades required for dairying and other industries being supplied. Enormous supplies are available in the dried-up lakes of southern Australia. Up to 1923 1,500,000 tons of crude salt had been produced in South Australia. Salt was exported from Kangaroo Island to Sydney as early as 1815.

G.W.C.

Saltbushes, vernacular name of plants of the family Chenopodiaceae, belonging to six genera, of which *Atriplex* with 23, *Bassia* with 38, and *Kochia* with 29 indigenous species have a wide range outside Australia; the endemic genus *Rhagodia* has 12 species. They are chiefly soft-wooded shrubs with succulent leaves—often gray or sage-green, on account of a salty or mealy incrustation. Mostly natives of the interior plains, to the climate of which they are adapted, they provide a considerable share of natural fodder, and are especially relished by sheep, which in times of drought have been known to subsist for 12 months on saltbush alone. The saline constituents, moreover, are stated by some pastoralists to act beneficially on the fleece. *Atriplex nummularia* (Old Man Saltbush) is one of the tallest, most fattening and wholesome of these, and stock depastured on it are said to be free from flukes (see LIVER-FLUKES). An analysis of the leaves shows a 16 per cent albuminoid content, with 42 per cent of carbohydrates. Over-stocking has largely displaced this bush. The plant is often grown as an ornamental hedge in Australian gardens, for which it is admirably adapted, growing rapidly from seeds or cuttings. *A. leptocarpa* (Creeping Saltbush) is abundant on the black soils, and *A. vesicaria* (Bladder Saltbush), *A. halimoides* (Dwarf Saltbush), and *A. semibaccata* are common on the red soils of New South Wales; the last is a low compact herb that will stand close cropping. The genus *Kochia*—sometimes called cotton-bush—has densely hairy leaves, narrower than those of *Atriplex*. *K. pyramidata* (Bluebush) is highly nutritious, 63 per cent of the whole plant being available as fodder. *K. villosa*, and its variety *aphylla*, are also good food-plants. *Rhagodia* appears to persist more in the cooler districts, *R. linearis* and *R. hastata* being commonly found on the coastal ranges of New South Wales, in shady or sheltered situations. The largest of all, *R. parabolica*, now rare, was used in early times as a vegetable—after repeated boiling to remove the salt, of which 2 oz. has been extracted from 2 lb. of leaves. An analysis of this plant shows that 63 per cent of it is available as fodder. *R. nutans* is common in the interior.

Enchylaena tomentosa (Barrier Saltbush) is a common plant, much appreciated by stock, that recovers quickly after close grazing. Of native species of *Chenopodium* (goose-foot), *Ch. auricomum*, *Ch. nitrariaceum*, and *Ch. triangulare* are annuals, producing good spring feed. *Bassia* (roly-polys) although eaten in their young stages, are more or less noxious weeds in cultivated land.

Old Man Saltbush.
(Below: Fruit-bearing calyces).

Saltbushes are also indigenous to North America, but the Australian species have been found more useful to farmers and have been acclimatized sedulously in California. In 1881 von Mueller sent a packet of seeds to the university of California; since then experiments have been made with *Atriplex leptocarpa, vesicaria, halimoides, nummularia,* and *semibaccata. A. semibaccata* is particularly useful in the reclamation of alkali land, on which it thrives, taking up the deleterious salts to the extent of about 110 lb. in each ton of green forage; by removing the crop every year the salt-concentration in the soil is thus gradually diminished.

E.B.

Salvado, Dom Rudesindo (1814-1900), born at Tuy in Spain, embraced the monastic life at an early age and entered the Benedictine abbey of St. Martin at Compostella. On the suppression of religious houses in Spain (1835) he went with Dom Serra (q.v.) to the Cassinese monastery of La Cava in Italy; and after ten years' residence there the two friends, anxious to undertake missionary work, were accepted by Bishop Brady to work in the diocese of Perth. They reached Western Australia early in 1846, and in the following year established a monastery at New Norcia (q.v.) as the centre of a mission to the aborigines. In 1849 Dom Salvado, while on a visit to Europe, was appointed bishop of the settlement at Victoria on Port Essington; but the British government abandoned the settlement at the end of that year, and the new bishop, who had not even had time to leave Europe, found himself without a diocese. He devoted himself, therefore, to writing a series of historical memoirs on Australia, which were published at Rome (in Italian) in 1850 and translated into Spanish (1853) and French (1854). Returning to New Norcia, in 1853 he administered the diocese of Perth for two years during Bishop Serra's absence, but for the rest of his life was chiefly engaged with the affairs of his monastery and the aboriginal settlement connected with it. In 1866 he was nominated bishop of Perth, but, appealing directly to Rome, was allowed to refuse the honour: the next year Pius IX by special decree constituted the monastery an abbey *nullius dioecesis* with Dom Salvado as perpetual abbot and bishop—the only mitred abbot in Australia. In 1889 he resigned the nominal bishopric of Victoria, and was made bishop of Adriana *in partibus*. He died at Rome, during one of his periodical visits there, on 29 December 1900. See Benedictine Order. E.M.O'B.

Salvation Army, The. Towards the end of 1880 John Gore and William Saunders, discovering in Adelaide several other members of the Army, began to conduct a mission there on Army lines and appealed to London for assistance. In response William Sutherland, with his wife and four other officers, reached Adelaide in February 1881, and formally established the Army; in 1882 James Barker with another party of officers from London began to organize the work throughout Australia. In the early part of that year a beginning had been made at Sydney, and Barker, after founding four corps in South Australia, moved to Melbourne and established one at Collingwood. Soon missions were at work in North Melbourne, Prahran, Melbourne city, Brunswick, Ballarat, Bendigo, and Geelong; other important centres of population asked for the establishment of local stations, and reinforcements of officers had to be obtained from England. In Tasmania the work began in 1882. In New South Wales the Sydney station was followed by those at Balmain, St. Peters, Newcastle, Wallsend, Maitland, Tamworth, Grafton, Goulburn, and Bathurst. By the end of 1883 the Army was well established, and great numbers were attracted to its meetings. In addition to, and in aid of, these evangelistic operations printing-presses were set up in three colonies to issue the weekly *War Cry* and a monthly magazine. On 1 January 1884 (its third anniversary) the Army reported 56 stations working and 127 officers permanently engaged. Meanwhile a prison rescue brigade was established in Melbourne, won praise from the press, and induced the Berry government—the first in the world to recognize the Army officially—to grant £1000 towards its expenses, at the same time housing it at a nominal rental. In July 1884 Commissioner Howard was sent out, accompanied by M. B. Booth, to organize and establish Army activities on a permanent working basis. By the end of the year he reported 177 corps under 317 officers, with five local editions of the *War Cry* selling 75,000 weekly.

This work was not accomplished without opposition. Officers and soldiers were ill-treated by the rowdy element everywhere, and police protection was often needed. In June 1885 the commissioner completed arrangements for opening a mission in Brisbane. Leading citizens contributed largely to the funds, and centres were quickly opened at Toowoomba, Maryborough, Gympie, Townsville, and smaller places. In October 1888 the Army observed for the first time its All-round-the-world-week-of-self-denial, during which the Australian wing raised £1200—in 1911 a similar effort resulted in £28,800 being raised in Australia. To meet the needs of the Western Australian goldfields a small detachment of officers left Melbourne at the end of 1891 for that colony and opened up centres there as rapidly as in the other colonies. During the war of 1914-18 the Army constructed huts at all training-camps throughout Australia, as well as at the front.

The chief activity of the Army is its rescue work among the outcast, fallen, and criminal classes. It conducts rescue and maternity homes, a prison-gate brigade, industrial homes for men (where useful trades are taught), orphanages, and hospitals. A special feature of the Australian wing is its reformatory work amongst young people, which is carried out on a larger scale than in any other country. Since 1920 Australia has been organized into two territories; the southern includes Victoria, South and Western Australia, and Tasmania; the eastern comprises New South Wales and Queensland. Each territory is ruled by a territorial commander holding the rank of commissioner. In 1925 the eastern had 664 centres of work under 821 officers, the southern 604 centres and 929 officers. Two training-colleges supply a constant stream of new officers. The Melbourne college (established in 1900) accommodates 180 students, and that at Sydney (established in 1921) about 100. In 1924 General William Bramwell Booth paid a visit of inspection. Since 1923 a hospital has been built at Brisbane, a hostel for women and a shelter for men in Sydney, and an Eventide Home in Adelaide.

J.V.C.-B.

Samphire. See Chenopodiaceae.

Samson-fish. See Kingfish.

Samuel, Sir Saul (1820-1900), born in London on 2 November 1820 and brought to Sydney by his parents in 1832, was educated at the Sydney College under W. T. Cape, and after a short commercial training joined a brother in the management of sheep-stations in the west of New South Wales. When gold was discovered in 1851 he abandoned squatting for mining and manufacturing, and entered politics. In 1854-6 he represented the counties of Roxburgh and Wellington—that is, the area between the Blue Mountains and the town of Wellington—in the legislative council, and in the assembly under responsible government represented Orange (1859-60), Wellington (1862-9), Orange again (1869-72), and East Sydney for a few months

in 1872. He was then nominated to the legislative council (1872-80), and on 12 August 1880 was made agent-general for the colony.

His political career was marked by many ministerial appointments. He was treasurer in the Forster ministry of 1859-60, and effected the financial arrangements necessary for the separation of Queensland. He was also treasurer in the fourth Cowper ministry (1865-6), and in the Robertson Cowper ministries of 1868-70. When he was transferred to the legislative council, it was to represent the Parkes ministry (1872-5) there; in December 1872 he was made postmaster-general, and in 1873 established a subsidized mail-service from England to Australia via San Francisco. He was also postmaster-general under Parkes in 1877 and 1878-80. As agent-general he negotiated the despatch of the Sudan contingent (q.v.) and represented his colony (and sometimes Queensland) at several European exhibitions and at the colonial conference of 1887. In 1897 he resigned the agent-generalship, but remained in London, and died there on 29 August 1900. (C.M.G., 1874; K.C.M.G., 1882; C.B., 1886; baronet, 1898.)

Sandalwood. See FUSANUS and SANTALUM. The name is also applied less justifiably to a few other trees with scented timber, e.g. *Eremophila Mitchelli* (Bastard Sandalwood) and *Alyxia buxifolia* (the Native Sandalwood of Tasmania); the 'black sandalwood' of Western Australia, though scentless, is so called from its resemblance to *Fusanus spicatus* in growth and habit.

Sand-flies. See BLOOD-SUCKING FLIES.

Sandford, DANIEL FOX (1831-1906), born on 25 July 1831 at Glasgow, grandson of a bishop of Edinburgh and son of a professor of Greek in the university of Glasgow, was trained for the Church of England ministry (deacon, 1853; priest, 1855), in 1863-72 was examining chaplain to the bishop of Edinburgh, and in 1878-83 canon of St. Mary's cathedral, Edinburgh. On 25 April 1883 he was consecrated bishop of Tasmania, and enthroned at Hobart on 8 September. For six years he ruled his diocese with energy and devotion, establishing many new churches and schools; then he returned to England, and was made assistant bishop in the diocese of Durham with the rectory of Boldon, working there under bishops Lightfoot and Westcott. He died on 22 August 1906.

Sandhoppers, animals belonging to the group Amphipoda of the class Crustacea, subclass Malacostraca. Like the woodlice (q.v.), they are distinguished from the other Malacostraca—shrimps, crabs, crayfish, etc.—by the position of their compound eyes, which are sessile instead of being placed at the end of a short movable stalk. The two groups also resemble each other, and differ from the stalk-eyed crustacea, in having no shell-like covering (carapace) to the anterior part of the body. The head is distinct, and is followed by seven separate segments in the mid-body, and six segments, more or less distinct, in the tail. The head is formed of six coalesced segments (the posterior one really belonging to the mid-body), each typically bearing a pair of jointed appendages, of which the two anterior form antennae or feelers and the others mandibles or accessory mouth-organs. Each segment of the mid-body has a pair of jointed appendages which are usually walking-legs, though one or two of the anterior pairs may be modified into grasping-organs. The six segments of the tail also bear appendages, whose use is discussed below.

Amphipoda differ from Isopoda in having the body more or less compressed from side to side, and the breathing-organs attached to the appendages of the mid-body; the three anterior appendages of the tail form swimmerets, and the posterior three, caudal stylets. Isopoda usually have the body flattened from above downwards; the five anterior appendages of the tail are modified into gills, and only the last pair forms the tail appendage.

Most amphipods are marine, many living in shallow waters near the shore and others extending into deep water; a few have made their way into the fresh waters of streams and lakes; and in most countries a few species are almost entirely terrestrial. Those properly called 'sandhoppers' live on the seashore, hiding under stones or seaweed, or burrowing into the sand at about high-water mark; they are mostly nocturnal in habit, but if during the day a mass of seaweed is turned over they leap vigorously away by suddenly extending the curved end of the body. The common European sandhopper is *Talitrus saltator*; in Australia and New Zealand there are several species, belonging to the genera *Orchestia, Talorchestia,* etc. In Australia and Tasmania one species, *Talitrus sylvaticus,* has become purely terrestrial, and may be found under decaying leaves, etc., far away from the sea at heights up to 3000 feet. The Australian freshwater species belong to the genus *Gammarus* (of which there are many freshwater species in Europe, Asia, and North America) and to *Neoniphargus,* a genus which appears to be confined to Australia. Some of these freshwater species, which have adopted a life in underground waters, have become specially modified; the eyes have degenerated until they are in some cases entirely absent, the colour has disappeared, and other changes in the structure of the body have adapted the animals to subterranean conditions. They may be brought to the surface by pumping from wells, and hence are commonly known as 'well-shrimps.' Subterranean species of *Niphargus* and allied genera have long been known in Europe, and blind species of *Niphargus* and *Neoniphargus* have also been recorded from various localities in Australia.

The terrestrial and freshwater species of Amphipoda are of little economic importance; most of them are vegetable-feeders, and the

Neoniphargus westralis (male), a blind, freshwater amphipod from Western Australia.

terrestrial form is sometimes very abundant in gardens, where they have been known to attack strawberries. The freshwater forms doubtless supply part of the food of fish living in the same streams. Marine amphipods serve as food for fish and other marine animals; many are themselves carnivorous. During the Antarctic expeditions amphipods were often obtained in

great numbers by using a dead fish or penguin as bait, with the additional advantage of having the skeleton cleared of flesh by the animals.

The sexes of amphipods are separate, the male often differing from the female in the shape of the body or the structure of some appendages; one of the appendages in the male may form a grasping-organ sometimes as large as the whole body. The eggs are carried by the female in a brood-pouch under the mid-body till they hatch out in a form nearly the same as that of the adult.

Amphipods are often extremely abundant in the colder Arctic and Antarctic seas, a single species being sometimes represented by many thousands of individuals, which attain a much larger size than individuals of the same or allied species found in warmer seas. In some cases species abundant in the colder northern and southern seas are unknown in the intervening seas; these are termed 'bipolar species.' Fossil remains of Amphipoda are very rare, and are known with certainty only from Tertiary and post-Tertiary deposits.

See Sars's *Crustacea of Norway* (vol. i, Amphipoda); Stebbing's 'Amphipoda Gammaridea' in *Das Tierreich* (vol. xxi); and Chilton's 'Subterranean Crustacea of New Zealand' in the *Transactions* of the Linnean Society of London, vol. vi (Zool.).

C.C.

Sandpiper. See WADERS.

Santalaceae, a widespread family of herbs, shrubs, or trees, found chiefly in temperate regions; seven genera with 45 species are indigenous to Australia. The flowers are small; leaves, in some species, reduced to minute scales; fruit a nut, drupe, or berry. The most important genera are *Fusanus* (q.v.) and *Santalum* (q.v.); the native currant and native cherry are also members of this family. See 'The Root Parasitism of Western Australian Santalaceae' by D. A. Herbert, in the *Journal* of the Royal Society of Western Australia, xi, 127.

Santalum, a genus of the family Santalaceae consisting of trees or shrubs; three species are endemic in Australia, and several others extend to India and the Pacific, nine occurring in the Hawaiian Islands alone. The flowers are small, leaves relatively large, fruits globular with a succulent coat. *S. lanceolatum* has a small purple fruit of an agreeable taste. Both this species and *S. obtusifolium* yield an inferior sandalwood; *S. album,* which yields the most esteemed variety of sandalwood, occurs chiefly in Mysore, India. *Fusanus spicatus,* the Western Australian sandalwood (for which see FUSANUS), is sometimes called *Santalum cygnorum.*

Sapindaceae, a large family of trees and shrubs (rarely herbs or climbers), chiefly tropical. Ten genera with 123 species are indigenous to Australia, and most of them are endemic. *Schmidelia* is a tropical genus, most numerous in America; *S. serrata,* which occurs in northern Australia and extends to Asia, bears small red edible berries. The roots are astringent. *Cupaniopsis anacardioides* is a slender tree with a coastal range from New South Wales to northern Australia; it is usually found in brush forests, and likes the neighbourhood of salt water. It has a light, pinkish, tough timber, occasionally used for building purposes. See ATALAYA, DODONAEA, HARPULLIA, HETERODENDRON.

Sapotaceae, a widely dispersed family of trees and shrubs with entire leaves and clustered flowers, chiefly tropical. Six genera with 23 species are indigenous to Australia. *Niemeyra prunifera* is a small, rather ornamental tree with a tough, pale-yellow wood. *Hormogyne* is limited to a single endemic species, *H. cotinifolia,* a diffuse shrub with small leaves and solitary flowers on recurved stalks. It has a hard, dark-yellow wood. *Mimusops,* with 2 indigenous species, is widespread; *M. Browniana,* found in north-eastern Australia, has an edible fruit one inch long; *M. parvifolia* yields a thick sap, which tastes somewhat like milk. See SIDEROXYLON.

Sapphires. See GEMSTONES and MINERALOGY.

Sarcophilus. See TASMANIAN DEVIL.

Sardine. See PILCHARD.

Sassafras, a name popularly given to three very distinct trees, two belonging to the family Monimiaceae and the third to the Lauraceae; (1) *Doryphora sassafras,* usually known as the

Doryphora sassafras.

New South Wales Sassafras, though it ranges northwards to the Logan River in Queensland; (2) *Atherosperma moschatum* (Victorian Sassafras), common in Victoria and Tasmania, less common in New South Wales, and extending just into Queensland; (3) *Cinnamomum Oliveri* (Queensland Sassafras), which belongs to the Lauraceae. *D. sassafras* is the only species of its genus, and is endemic. It is a tree of 60-80 feet, with white star-like bisexual flowers and dark shining leaves with an aromatic odour; tea made from the bark is a tonic medicine, and provides a pleasant beverage. The timber, which is fragrant when newly cut, and inhospitable to vermin, has been found durable for building purposes. *A. moschatum* is a tree reaching 100 feet in height, with unisexual flowers on distinct plants. The odour of its fragrant bark is due to an essential oil reminiscent of the exotic *Sassafras officinale* (the sassafras of commerce); a decoction from the bark has been used for tea in Tasmania. The oil is diuretic, and has been employed in asthma and other pulmonary complaints; in the early days it was

especially valued for its sedative action on the heart. An oil obtained from the leaves resembles oil of mace. The timber is used for sash- and door-frames, and is particularly suitable for making sounding-boards for musical instruments. The bark of the Queensland sassafras is also rich in oil. For black and gray sassafras see CRYPTOCARYA.

Satin-bird. See BOWER-BIRDS.

Satin-wood. See DAPHNANDRA.

Savings Banks. *History and Chronology.* —The first savings bank in Australia was founded in Sydney at a meeting held in the general hospital on 5 June 1819, and presided over by Governor Macquarie. Among other resolutions passed at that meeting the following were reported in the *Sydney Gazette* of 19 June 1819:—

1. That the present Meeting have long witnessed with Sorrow the Extravagance and Improvidence which the poor Settlers, Mechanics, Servants, and Labourers of this Colony have fallen into, by Reason, first, of their having no Encouragement to save their Earnings; and secondly, of their having, from the peculiar Circumstances of this Colony, no Place of safe Deposit for those Earnings, whereby Payments for Produce or Labour are generally made to them in Property or Barter, in which Account both the Labour and the Property are rated upon an artificially high Scale, and the little Money that passes is quickly dissipated in Spirituous Liquor or Gambling; a System which mainly tends to keep them poor, vicious, and unmarried, and is therefore of the deepest Injury to the Colony.

2. That it appears to this Meeting that a great Part of these Evils would be remedied, and Habits of Economy, Industry, and Matrimony generated, by one of those recent and laudable Institutions of the Mother Country, called a Saving Bank.

3. That Mr. R. Campbell, sen. of Sydney; Mr. H. M'Arthur, of Parramatta; Mr. Wm. Cox, jun. of Windsor; and Mr. Moore, of Liverpool, be duly authorised by the Committee hereinafter named of the New South Wales Saving Bank, on every Saturday, at 10 o'Clock in the Morning, or at such other Day and Time as they shall appoint, to open a Book for the Receipt of any Sum, not less than two Shillings and Six-pence, from any poor Person of his Neighbourhood, male or female, married or single, and for the Re-payment of such Sum on demand, but only at the same Day and Time.

4. That these Depositaries or Bankers shall not be required to give the Depositers any written Receipt or Acknowledgment as long as the Saving is under the Sum of £1; but shall receive and re-pay Money under that Sum, upon personal Sight of the Depositary, or other Evidence at Discretion, simply recording the Fact in his Book.

5. That immediately upon such Deposit having amounted to one Pound, the Depositer shall receive a printed Receipt for the same, signed by the Banker, who shall, upon every such Sum having remained in his Hands for a complete Year, but not otherwise, be liable to pay to the Depositer, or his legal personal Representative, the further Sum of one Shilling and Six-pence, by Way of Interest, for every such Pound, for every such complete Year that it shall have been left in the Hands of the Banker.

The savings bank thus established commenced operations on 17 July 1819 at Sydney, Parramatta, Liverpool, and Windsor. It was popularly known as 'Campbell's Bank,' and continued until 1833, when its deposits were transferred to the Savings Bank of New South Wales, which had been constituted by an act passed in 1832. This was the first savings bank legislation in Australia, and formed the foundation of a series of enactments which gradually developed until every colony provided its inhabitants with a safe and convenient depository for their savings. In 1841, on account of the increase in population and distance from Sydney, a separate institution called 'The Port Phillip Savings Bank' was established by an act passed 1 September 1841.

The board of commissioners appointed in England to carry out the provisions of the South Australian Colonization Act passed on 14 August 1834, furnished the resident commissioner, James Hurtle Fisher (q.v.), with a body of instructions in which they said: The economical institution which seemed best calculated to promote habits of frugality and industry and to bind the working classes to the colony was a Savings Bank.' A general meeting of immigrants was held in Adelaide on 12 February 1840, Major O'Halloran in the chair, at which it was decided to establish a savings bank and to begin operations on 16 March. This institution was superseded by The Savings Bank of South Australia, the act for which was passed on 22 September 1847.

In Tasmania, 'an Act to encourage the establishment of Banks for Savings' was passed on 22 September 1848. Prior to this, however, two savings banks had been established by men of philanthropic and beneficent ideas, the first at Launceston in 1835 and the other at Hobart in 1845, and the act of 1848 was rather to regulate them and any others which might be established.

In 1851 the Port Phillip district of New South Wales was constituted the colony of Victoria, and on 7 February 1853 its savings banks passed into the control of a board known as 'The Commissioners of Savings Banks.'

In 1854 an act was passed to incorporate a savings bank for the district of Moreton Bay, and under its provisions 'The Moreton Bay Savings Bank' was established. It was not until 1859 that this district was created a separate colony, known as Queensland.

In 1856 Western Australia established a savings bank which was, however, closed the following year, the provisions of its charter being found impracticable. After a lapse of six years another was established, but on different lines. The new savings bank (constituted by an act passed on 1 July 1863) was the first of the 'post-office' savings banks which ultimately were established in all the Australian colonies, except South Australia.

Post-office savings banks were opened in Victoria and Tasmania in 1865, and the same year the assets of the trustees of the Moreton Bay Savings Bank were vested in the colonial treasurer of the colony of Queensland and incorporated in the Queensland Government Savings Bank—a post-office savings bank. Two years later the Savings Bank of South Australia began to use the post-offices as its agencies, and in 1871 the Government Savings Bank of New South Wales was established as a sub-department of the post-office. The development of the latter which is to-day (1926) the largest savings bank in the British Empire except the Post Office Savings Bank of the United Kingdom, will be traced under the other headings of this article. At this stage there were, therefore, post-office savings banks under government control in every colony except South Australia (in which colony, however, the post-offices were used as savings bank agencies, as has been mentioned), and trustee-controlled savings banks in New South Wales, Victoria, South Australia, and Tasmania.

In 1896 the post-office savings banks of Victoria and its trustee banks under the control of the commissioners of savings banks were amalgamated and named 'The Savings Bank.' This bank operated through branches staffed by officers appointed by the commissioners and through the post-offices as agencies for the receipt and repayment of deposits. The act of amalgamation provided for the business of the bank to be carried on by (*a*) the savings bank department (*b*) the advances department, the latter obtaining its funds by the issue of debentures guaranteed by the government.

The federation of the Australian colonies in 1901, which involved the transfer of the post-offices to the Commonwealth government, necessitated legislation to provide for the future control of the post-office savings banks in the colonies other than Victoria, Queensland, and South Australia, where the banks were not under the departmental administration of the post-office. Acts were passed in 1900 in New South Wales and Western Australia, and in 1901 in Tasmania, placing the banks under the control of the State treasurers of the respective States. The name of the Tasmanian bank was altered to 'The State Savings Bank.'

In 1906 an important change was made in the administration of the Government Savings Bank of New South Wales, which from 1 January 1907 was placed under the control of a board of three commissioners whose appointments were for life. At the same time an advance department was created to make advances to farmers and primary producers. The liquidation of the advances made by the Advances to Settlers Board (a relief board created in 1899 to alleviate the conditions arising from the severe drought of that period) was included in the new commission's duties.

The establishment of the Commonwealth Bank of Australia in 1912, and the subsequent notice given to the State savings banks which had agencies at post-offices that those offices would not in future be available to them, caused the State banks to look for other agencies. These were found in State government officials such as crown lands agents, clerks of petty sessions, registrars, police, etc., and business agents, storekeepers, professional men and—in Victoria and South Australia—the various trading banks. In Tasmania the State government, rather than continue its State bank under the new conditions, transferred the business to the Commonwealth Bank. Post-offices thus became agencies for the Commonwealth Savings Bank throughout the whole of Australia. Contrary to expectations at the time, the business of the State savings banks did not suffer as a result of the change, but rather increased under the new arrangements, since the agents were paid a commission on the business transacted by them, and thus had a monetary inducement to advertise and popularize the bank.

For many years attempts had been made by successive governments to amalgamate the two savings banks in New South Wales, and finally, in 1914, the amalgamation was effected. On 1 May 1914 the commissioners of the Government Savings Bank of New South Wales took over the business of the Savings Bank of New South Wales, and the historic bank lost its identity in the amalgamated institution.

In 1917 the Agricultural Bank and the Workers' Dwellings Board in Queensland were amalgamated with the Queensland Government Savings Bank, which was at the same time removed from the control of the State treasurer and placed under a commissioner. In 1920 the Queensland government decided to end the competition between its own and the Commonwealth Savings Bank, and transferred the business of the Queensland Government Savings Bank to the Commonwealth Bank under an agreement whereby 70 per cent of the increase in depositors' balances each year was to be invested by the Commonwealth Bank in Queensland government stock. The lending functions of the transferred savings bank were vested in the 'State Advances Corporation,' the title of which was later changed to the 'Agricultural Bank.'

At the present time (1926) the savings banks operating in Australia are as follows:—

Commonwealth Bank—operating throughout the Commonwealth, and without competition in Queensland.
Government Savings Bank of New South Wales.
State Savings Bank of Victoria.
Savings Bank of South Australia.
Government Savings Bank, Western Australia.
Hobart Savings Bank, Tasmania.
Bank for Savings, Launceston, Tasmania.

Control and Administration.—The administration of the savings banks in Australia has to some extent been dealt with under the heading History and Chronology, but it is desirable to amplify the information there given.

The Commonwealth Bank—savings bank department—is controlled by the board of the Commonwealth Bank, which consists of eight members appointed by the governor-general-in-council to hold office for seven years. This board is entirely independent of government policy in its administration, but section No. 15 of the Commonwealth Bank Act of 1924 provides that the secretary of the Commonwealth treasury shall ex officio be a member, and so constitutes a liaison between the government and the board. The bank is guaranteed by the Commonwealth government.

The Government Savings Bank of *New South Wales* is administered and controlled by a board of three commissioners appointed by the governor-in-council and engaged solely in the duties of their office. A commissioner can be removed only for inability or misbehaviour and by resolution of both houses of the State parliament. The repayment of all deposits, and the principal and interest on stock and debentures issued by the rural bank and the advances for homes department is guaranteed by the State government. In *Victoria* the State Savings Bank is controlled by a board of five commissioners appointed by the governor-in-council. They are paid fees for their attendance, and under them the actual administration is vested in a general manager. The bank is guaranteed by the government of Victoria similarly to the Government Savings Bank of New South Wales. The Savings Bank of *South Australia* is controlled by a board of six trustees appointed by the governor-in-council. Two trustees retire each year, but may be reappointed. They are paid fees for attendance. The administration is vested in a manager. The bank is guaranteed by the State government. The Government Savings Bank, *Western Australia*, is controlled by the State treasurer with an executive manager. The investment of the funds in terms of the acts controlling the bank's operations is vested in the State treasurer. The bank is guaranteed by the State government. Both the Hobart Savings Bank and the Bank for Savings, Launceston, *Tasmania*, are controlled by a general committee,

of whom six in the former case and seven in the latter form an executive. Neither bank is State guaranteed.

Activities.—A review of the activities of the savings banks of Australia shows the very important part they have played in the development of the country. From the humble beginning in Campbell's Bank, intended by its sponsors as a depository for the necessarily small savings of the thrifty poor, they have developed into institutions controlling savings amounting, in 1926, to over £183,000,000. Their importance, however, lies in the fact that not only have they provided means throughout the length and breadth of Australia for the saving of money by the thrifty, and so encouraged the practice of thrift, but also in the manner in which the funds so accumulated have been invested. In this last-mentioned respect the savings banks of Australia differ greatly from those in Great Britain and in some other parts of the Empire. The receipt of deposits (usually any amount from 1s. upwards), repayment at the will of the depositor with or without notice as the regulations of each bank may prescribe, and the allowing of interest on balances, up to certain limits, remaining in the bank for a complete calendar month, may be taken as the normal functions of all Australian savings banks. The present (1926) rates of interest and the limits up to which interest is paid are as follows:—

Commonwealth Savings Bank of Australia: 3½ per cent up to £1000; 3 per cent on excess to £1300.
Government Savings Bank of New South Wales: 4 per cent up to £500; 3½ per cent on excess to £1000.
State Savings Bank of Victoria: 4 per cent up to £500; 3½ per cent on excess to £1000.
Savings Bank of South Australia: 4¾ per cent up to £500. If account closed during the year, 4 per cent only.
Government Savings Bank, Western Australia: 3½ per cent up to £1000. Fixed deposits, 1 year, 4½ per cent; 2 years, 5 per cent.
Hobart Savings Bank, Tasmania: 4½ per cent, limit £300.
Bank for Savings, Launceston, Tasmania: 4½ per cent, limit £300.

The State Savings Bank of Victoria also issues deposit stock, on which interest at 4 per cent is paid up to £1000, and this stock is repayable on notice varying with the amount. The Government Savings Bank, Western Australia, accepts fixed deposits for periods up to two years.

By a reciprocal arrangement between all the State savings banks, depositors may make withdrawals from their accounts through any of the banks in the agreement. As there is no State savings bank in Queensland, arrangements have been made with the Queensland National Bank for the convenience of depositors visiting that State. This arrangement is a special feature of Australian State savings banks and is not found in any other part of the world. Depositors in the Commonwealth Savings Bank can deposit and withdraw moneys at any of the bank's branches or agencies in the States and Territories.

In addition to ordinary savings bank accounts, the savings banks in New South Wales, Victoria, South Australia, and Western Australia have school savings bank departments for the encouragement of thrift among school children. Deposits as small as 1d. are accepted. The latest available statistics show that in these school savings banks there are 226,212 depositors with a total amount to credit of £281,579.

Investment of Funds.—The investment of a proportion of their funds on mortgage is included in the activities of all the Australian savings banks, but in New South Wales and Victoria this is not done by direct lending from the savings bank (except for what may be termed investment mortgages for periods of generally one to three years), but through the medium of separate lending departments. In the Government Savings Bank of New South Wales there are two such lending departments: (1) rural bank, (2) advances for homes; but in the Victorian State Savings Bank loans are made both to farmers and to home-builders from the advances (credit foncier) department.

The extent to which savings banks in Australia have assisted to finance (*a*) farmers and other primary producers, in the purchase, development, stocking, and improvement of farms, and (*b*) home-purchasers or builders, by loans at reasonable rates of interest, is believed to exceed similar activities of any other savings banks in the world. In all the States, except New South Wales and Victoria, loans to farmers and home-builders have been made only from funds available from the savings bank, but in the States mentioned other funds have been raised entirely separate from the operations of the savings bank departments.

In New South Wales this has been done by the conversion of the advance department into a rural bank department [Government Savings Bank (Rural Bank) Act of 1920] which is unique. The rural bank operates through the savings bank branches. It opens cheque accounts, accepts fixed deposits, discounts approved bills, and generally affords banking facilities to customers in both city and country, but it confines its advances to primary producers and industries immediately associated with primary production. In 1926 the funds of the banking operations of this department are: (*a*) from current accounts, £1,615,546; (*b*) from fixed deposits, £3,172,951; total, £4,788,497. The bank act requires that 20 per cent of the quarterly average of deposits in the rural bank department shall be held in cash or available at short call, but the remaining 80 per cent is available for advances. In addition to these funds, a public issue in 1923 of stock and debentures bearing interest at 5½ per cent and redeemable in 1933 brought in over one million pounds, which was utilized for advances for the purchase of farms on closer settlement areas. Prior to this public issue the savings bank department had purchased advance or rural bank department stock to a total of £4,562,000.

At the present time the funds of the rural bank department total £10,980,148, obtained as follows:—

From the issue of inscribed stock to the savings bank department	4,562,000
From the public issue of stock and debentures	1,012,150
From the public issue of treasury stock (advances to settlers board)	120,050
From current accounts	1,615,546
From fixed deposits	3,172,951
From reserve fund	243,272
From bills in circulation, etc.	254,179
	£10,980,148

Current advances total £9,077,675, of which £5,701,538 is outstanding on long-term loans and £3,376,137 on overdraft on current account. The number of advances current is: long term, 9309; overdraft, 6104; total, 15,413.

The advances for homes department of the

Drawn by N. W. Cayley and F. S. Rodriguez.

Hanhart Gold Engr.

1. Greenshank (*Tringa nebularia*).
2. Bartram Sandpiper (*Bartramia longicauda*).
3. Australian Snipe (*Gallinago hardwicki*).
4. Australian Painted Snipe (*Rostratula australis*).
5. Broad-billed Sandpiper (*Limicola falcinella*).
6. Australian Pratincole (*Stiltia isabella*).
7. Oriental Pratincole (*Glareola maldivarum*).
8. Marsh Sandpiper (*Tringa stagnatilis*).
9. Wood Sandpiper (*Tringa glarcola*).
10. Common Sandpiper (*Tringa hypoleuca*).
11. Wood Sandpiper (*Tringa glareola*).
12. Terek Sandpiper (*Terekia cinerea*).
13 & 14. Lotus-bird (*Irediparra gallinacea*).

Government Savings Bank of New South Wales has been financed to the extent of £6,698,000 by the savings bank department and £1,014,850 by the public issue of a loan bearing interest at 5½ per cent and repayable in 1934. Since its commencement in 1914 this department has made 20,994 advances, for a total of £10,732,795, to persons purchasing or erecting homes for themselves and families. At the present date 16,372 of these loans are still current, the principal outstanding totalling £8,145,960.

The State Savings Bank of Victoria has financed its advances to farmers and home purchasers by the purchase of debentures by the savings bank department to a total of £10,505,200, and by public issues to the extent of £5,634,650. In addition to making advances for the purchase of newly erected homes, this bank builds homes by arrangement with eligible applicants and advances up to 90 per cent of the cost, with certain limits for different styles of construction. In the last published report (June 1925) the following statistics of current advances are given:—

	No.	Amount outstanding.
Advances on farms	4,524	£3,088,100
Advances on homes	24,933	£10,972,342
Advances on homes erected by bank	3,201	£1,921,263

All these loans are repayable on the credit foncier principle over extended periods. This bank also erects homes for returned soldiers by agreement with the war service homes commission.

In addition to the advances detailed above, loans on mortgage from savings bank department funds are outstanding as follows, but the reports do not indicate what amounts are apportionable between primary producers, home purchasers, and ordinary mortgagors:—

	Amount.
Government Savings Bank of New South Wales	£2,179,455
State Savings Bank of Victoria	1,382,416
Savings Bank of South Australia	4,374,378
Government Savings Bank, Western Australia	28,970
Hobart Savings Bank, Tasmania	411,942
Bank for Savings, Launceston, Tasmania	311,950

Investments in government stock and debentures by the savings banks have contributed substantial amounts which have been used by the various governments in developmental works. From the latest reports available the following statement has been prepared:—

	Amount.
Government Savings Bank of New South Wales	£29,797,047
State Savings Bank of Victoria	27,357,589
Savings Bank of South Australia	10,298,282
Government Savings Bank, Western Australia	4,823,211
Hobart Savings Bank, Tasmania	744,656
Bank for Savings, Launceston, Tasmania	673,618
Total	£73,694,403

Loans to municipal councils and statute-controlled corporations totalled £7,428,081 in the reports for the year 1925.

In the analysis given above of the principal forms of investments of savings bank funds, figures for the Commonwealth Savings Bank have not been included, as its funds are merged in the general funds of the bank, and although it is known that a large amount thereof has been lent to municipal councils, no separate statistics are available.

Statistics.—The progress of the savings banks in Australia, especially in recent years, is an indication of the increasing prosperity of the people and of the facilities and inducements for saving offered by the banks. At 30 June 1925 the total balances in all the savings banks was £183,009,156, represented by 3,812,930 accounts. The population at that date was 5,929,288, giving an average balance per head of population of £30 17s. 3d.

The following table shows the progression of savings bank deposits in Australia in periods of five years commencing with 1900, immediately prior to the federation of the colonies into the Commonwealth of Australia:—

PROGRESS OF SAVINGS BANK BUSINESS IN AUSTRALIA.

Year.	Government Savings Bank of New South Wales.		State Savings Bank of Victoria.	
	No. of depositors.	Total balances.	No. of depositors.	Total balances.
		£		£
1900	198,014	6,045,622	375,070	9,110,792
1905	254,331	7,952,885	447,382	10,896,741
1910	368,306	15,190,819	560,515	15,417,887
1915	694,812	33,536,257	721,936	25,044,029
1920	867,538	44,427,441	886,344	37,745,228
1925	1,093,684	60,546,786	1,095,462	53,988,654

The Savings Bank of New South Wales was taken over on 1 May 1914. Balances transferred, £8,835,266, number of depositors, 150,838.

Year.	Savings Bank of South Australia.		Government Savings Bank, Western Australia.	
	No. of depositors.	Total balances.	No. of depositors.	Total balances.
		£		£
1900	119,435	3,501,421	33,646	1,299,144
1905	146,366	4,398,041	59,764	2,207,295
1910	194,394	6,791,320	77,481	3,481,764
1915	250,031	9,050,815	107,234	4,651,822
1920	305,750	13,832,341	131,363	5,784,538
1925	368,408	17,785,518	159,608	5,971,286

Year.	Hobart Savings Bank, Tasmania.		Bank for Savings, Launceston, Tasmania.	
		£		£
1900	13,971	402,423	13,968	287,189
1905	16,076	486,481	17,205	372,165
1910	18,160	569,019	20,232	467,331
1915	22,465	768,587	22,728	612,589
1920	28,119	1,551,111	26.554	971,255
1925	36,529	1,815,689	34,575	1,169,095

NOTE.—Hobart and Launceston balances as at 31 August; others as at 30 June, except New South Wales where shown.

Commonwealth Bank of Australia.
(Commenced business in 1912.)

Year.	No. of depositors. (In Australia only.)	Total balances. (In Australia only.)
		£
1915	209,715	7,371,958
1920	533,922	17,792,638
1925	1,025,069	41,829,397

NOTE.—State Savings Bank of Tasmania was taken over in 1912 (balances, £795,505; depositors, 27,729). Queensland Government Savings Bank absorbed in 1920 (balances £14,706,929; depositors, 232,708).

NUMBER OF DEPOSITORS AND TOTAL BALANCES FOR EACH BANK SEPARATELY:—

Bank.	Number of depositors.		Total balances as at 30th June, 1925.
	Ordinary accounts.	School and Penny bank accounts.	
			£
Government Savings Bank of New South Wales	1,093,684	46,158	60,546,786
State Savings Bank of Victoria	1,095,462	88,751	53,988,654
Commonwealth Bank	1,025,069	.....	41,829,397
Savings Bank of South Australia	368,408	45,949	17,785,518
Government Savings Bank, Western Australia	159,608	45,354	5,971,286
Hobart Savings Bank, Tasmania	36,398	2,600	1,767,902
Bank for Savings, Launceston, Tasmania	34,301	.....	1,123,715
Total	3,812,930	228,812	£183,013,258

SAVINGS BANK DEPOSITORS AND TOTAL BALANCES IN EACH STATE AS AT 30 JUNE 1925:—

State.	Number of depositors.	Total balances.
		£
New South Wales—		
Government Savings Bank	1,093,684	60,511,479
,, ,, (School banks)	46,158	35,307
Commonwealth Bank	281,292	8,602,647
Total	1,421,134	69,149,433
Victoria—		
State Savings Bank	1,095,462	53,887,515
,, ,, (School banks)	88,751	101,139
Commonwealth Bank	152,880	5,563,241
Total	1,337,093	59,551,895
South Australia—		
Savings Bank of South Australia	368,408	17,718,469
,, ,, (Penny banks)	45,949	67,049
Commonwealth Bank	56,011	2,367,554
Total	470,368	20,153,072
Western Australia—		
Government Savings Bank	159,608	5,893,202
,, ,, (School banks)	45,354	78,084
Commonwealth Bank	72,739	2,332,647
Total	277,701	8,303,933
Tasmania—		
Commonwealth Bank	61,737	1,520,694
Hobart Savings Bank	36,398	1,763,800
,, (Penny banks)	2,600	4,102
Bank for Savings, Launceston, Tasmania	34,301	1,123,715
Total	135,036	4,412,311
Queensland—		
Commonwealth Bank ..... Total	397,710	21,339,901
Northern Territory and Papua—		
Commonwealth Bank ..... Total	2,700	102,713
Total for Commonwealth	4,041,742	£183,013,258

A.W.T.

Sawfishes, rays of the family Pristidae, closely resembling the saw-sharks but having their gill-openings on the under surface of the body. Their distribution is more tropical than that of the saw-sharks. They may attain a length of 24 feet. Their powerful rostral blade is armed with stout teeth on each side, and, when slashed from side to side in a school of smaller fish, can create great havoc. They have been known to attack man, and have inflicted terrible injuries on their victims. Several species are known from Australian waters; most occur in estuaries and inlets along the coast of the northern half of the continent, though individuals occasionally wander as far south as New South Wales. A.R.McC.

Saw-flies. See HYMENOPTERA.

Saw-sharks, small sharks of the family Pristiophoridae, with the snout produced into a long flat blade armed on each side with a row of sharp enamelled teeth. This forms an effective weapon of attack among schools of herring and other small fish. An interesting

feature associated with the development of the lateral snout-teeth is that in very young (foetal) specimens they are not fixed in an outstanding position as in adults, but are laid closely along the sides of the blade; this provision prevents them from lacerating the mother-shark, and they do not assume their normal position until after birth. Saw-sharks are plentiful in Australian waters, large numbers being caught by trawlers, and, like many other small sharks, they are useful (though but little appreciated) food-fishes. Though somewhat flattened and approaching the rays, they are true sharks, having their gill-openings on the sides of the neck. See SHARKS.

A.R.McC.

Saxifragaceae, a large family of herbs, shrubs, and trees, of wide variety, ranging over nearly the whole world; the shrubby or arborescent genera are chiefly tropical, the herbaceous section is mainly confined to cold or temperate regions. Twenty genera are indigenous to Australia, 12 of which are endemic. The tribe Cunonieae of Bentham is now raised to a family, Cunoniaceae. The Christmas-bush (q.v.) of New South Wales is a member of this family. *Argophyllum* is a genus of a few species, which extends to New Caledonia; *A. Lejourdani* has a yellow, hard-grained wood. *Abrophyllum, Acrophyllum,* and *Cuttsia* are endemic in eastern Australia, and limited to one species each. *Abrophyllum ornans* is a tall, handsome shrub, with small cream-coloured flowers; *Cuttsia viburnea,* a medium-sized tree with a profusion of small white flowers and a white, tough, close-grained timber; *Acrophyllum venosum,* confined to a small area on the Blue Mountains, is a handsome shrub with verticillate leaves in threes, and dense clusters of flowers in false whorls round the flower-spike, as in the garden mint. See BAUERA, POLYOSMA, QUINTINIA.

Scabbard-fish. See FROST-FISH.

Scaevola, a genus of the family Goodeniaceae, consisting of herbs or shrubs with solitary flowers, and represented in Australia (mainly in Western Australia) by 68 species. The calyx-lobes are occasionally obsolete—where present, they have 5 distinct segments; corolla oblique; fruit with a more or less succulent outer coat and hard stone. *S. suaveolens,* a carpet-forming, coastal sand-dune plant, and one of the most useful sand-binders, bears a profusion of bright blue flowers on erect spikes; its blue fruits are very ornamental. *S. Hookeri,* a prostrate herb, frequents marshy land on the dividing range.

Scale-insects. See COCCIDAE.

Scented Polypody. See FERNS.

Scheelite. See MINERALOGY and TUNGSTEN.

Schistosoma. See BLOOD-FLUKES.

Schizomeria, a genus of the family Cunoniaceae, containing one species, endemic in eastern Australia. The calyx-lobes are 5, persistent; petals small, jagged; stamens 10; fruit a drupe. *S. ovata* (White Cherry or Crab Apple) is one of the largest brush trees, attaining a height of 70-80 feet, with a diameter of 2-3 feet, supported by buttress roots. In young trees the bark is smooth, but becomes corky with age, and acquires a sour odour. The timber is inferior to that of the true coachwood, which it resembles, and for which it is sometimes substituted. Having no odour, it is suitable for butter-boxes and fruit-cases. The fruit is white, translucent and somewhat fleshy, with an agreeable acidity like that of loquats; but it has no claim to be considered an edible fruit.

Schofield, WILLIAM (1793-1878), born at Dudley Hill in Yorkshire in 1793, entered the Methodist ministry in 1826, and in April 1827 migrated to Tasmania to become the first government chaplain at Macquarie Harbour. An account of his four years' work there is given in his manuscript diary, now in the Mitchell Library at Sydney. Transferred to the mainland in 1832, he worked at Parramatta, Melbourne, and Sydney till 1851, when he retired from active work and lived in Sydney till his death in 1878. He bequeathed £40,000 to the Wesleyan Church to found a 'free and perpetual loan fund.'

J.C.

Schomburgk, RICHARD (1811-1890), brother of the more famous Sir Robert Hermann Schomburgk who in the thirties of last century explored British Guiana, was born at Freiburg in Saxony in 1811 and educated at Berlin and Potsdam. When the elder brother in 1840 was appointed commissioner for settling the boundaries of British Guiana, Richard went with him as botanist (1840-2), and in 1847 published a monograph on the botanical results of the expedition. In 1848 he was involved in political disturbances connected with the European unrest of that year, and hastily migrated to South Australia, where he took up land on the Gawler River, cultivated vines in partnership with his brother Otto, and became curator of the Gawler museum. When Otto died in 1866, Richard accepted the directorship of the Adelaide botanic garden, and for 24 years developed and improved it into an institution of great economic value to the community. Among the many plant-houses which he erected was one for the magnificent Victoria Regia lily which Robert Schomburgk had discovered in British Guiana. His work earned him several foreign decorations and the membership of many foreign scientific societies. He died at Adelaide on 24 March 1890.

Schools. This article deals mainly with secondary schools outside the various State systems (for which see EDUCATION, PUBLIC), and especially certain secondary schools which, originating in voluntary effort, have by right of a definite constitution and (usually) of association with some religious body attained a position entitling them to rank as 'public' schools. This epithet, however, needs definition. The nomenclature of schools in Australia is varying and inexact. What in South and Western Australia is called a 'high school' would in the eastern states be commonly known as a 'grammar school,' or by some other distinctive title, since in them a high school is part of the state system. The only privately owned 'high schools' in the east are a few belonging to the Roman Catholic body. In all the states non-state schools are bulked as 'private' schools. In New South Wales all state schools are termed 'public' schools; in Victoria they are 'state' schools. The incompatibility of this use of 'public' with the time-honoured English use has led to the formation in New South Wales (whence it has spread to other states) of associations of 'Great Public Schools,' including the older or more distinguished of the institutions owned or managed by non-state bodies; but the segregation of a few schools on this principal—involving as it does a tacit assumption of superior-

ity equivalent to that of the 'first-class counties' in English cricket—is a continual source of discontent. In this article the term 'public' school denotes a school owned or carried on by some public body apart from the state, not conducted for personal profit, and—in most states—recognized by the government as a 'continuation' school at which state bursaries and scholarships are tenable. Other non-state schools are classed as 'private.'

Theoretically there is no material difference between the educational standards of the Australian schools and those of Great Britain. So far as any advantage is possessed by the latter, it lies in the greater number of specialist scholars available as schoolmasters. To a large extent this is due to the higher emoluments ultimately obtainable in the teaching profession, and to the greater difficulty which such scholars there experience in finding avenues to other professions which are more lucrative. The statement commonly made that sport forms a larger element in the Australian schools than in the British also contains some truth.

The first attempt to establish a secondary school in Australia dates from 1806, when H. Perfact and George Howe (q.v.) opened rival schools with a slightly enlarged curriculum. In 1818 Macquarie mentioned in a letter to Samuel Marsden 'various classical schools at Sydney, Castlereagh, &c.;' but the first qualified teacher of classics was Laurence Halloran (q.v.), who in 1819 opened an 'Establishment for Classical, Mathematical, and Commercial Education' which soon became the favourite school for free settlers' children and wrung reluctant admiration even from Commissioner Bigge. For a few years more, however, settlers anxious to give their children a good secondary education managed to send them to England; but the influx of free settlers in Brisbane's and Darling's days led, in 1825, to the opening of a free grammar school founded by free settlers and military officers, with Halloran as headmaster. Unfortunately the trustees considered buildings more important than teachers, and reserved the bulk of their funds for building purposes, leaving the school to die for lack of a staff. A proposal for its revival under the name of 'The Sydney College' was made in January 1830, and in 1835 the buildings (which now form the big schoolroom and northern wing of the Sydney Grammar School) were opened with 60 pupils, William T. Cape (q.v.) being headmaster. The number of boys more than doubled during the year. In 1841 Cape resigned, owing to the persistent determination of the trustees to allot their funds chiefly for building purposes, and in 1847 the school was closed again. In 1851 the buildings were temporarily occupied by the young university of Sydney (see UNIVERSITIES). In 1854 an act incorporating a new 'Sydney Grammar School' was passed; in 1856 the buildings were repurchased from the university, and the southern wing added; and on 3 August 1857 the school was formally opened. Its progress is inseparably associated with the name of a great headmaster, Albert Bythesea Weigall (q.v.), who reigned—it is the precise word—for 45 years (1867-1912), during which period the roll increased from 53 to 560. The school has to its credit 10 out of 19 Rhodes scholars (q.v.), is famous in sport as in scholarship, and has a present roll of 650. Its old boys are prominent in the life of Australia and include such diverse types as Sir Edmund Barton, 'Banjo' Paterson, and Sir Harry Chauvel. Its honour roll of war service contains over 2000 names. Later headmasters have been H. N. P. Sloman, and A. H. S. Lucas. The present chief is H. S. Dettmann (formerly professor of classics at Auckland, New Zealand).

January 1830 was an important month in the history of Australian education. The revival of the free grammar school project has been mentioned above; at the same time the trustees of the clergy and school lands—prompted by the new archdeacon, William Grant Broughton—submitted to Darling a scheme for providing 'Grammar Schools and eventually a College in New South Wales,' which was to begin with two schools of royal foundation (to be called 'The King's Schools'), one for 100 day-scholars at Sydney, the other for from 60 to 80 day-scholars and boarders at Parramatta. The scheme is reproduced in the *Historical Records of Australia* (series I, vol. xv, pp. 356-367). It was approved by the colonial office in March 1831, and in January 1832 the Sydney school was opened under George Innes, a nominee of the colonial office who had high qualifications; he died in September, and no successor was appointed—possibly because it was found that Cape's school (see CAPE, WILLIAM TIMOTHY) and Dr. Lang's Australian College supplied Sydney's needs. The school at Parramatta was opened in January 1832 with 20 boys under Robert Forrest, a nominee of the colonial office; before he resigned in 1839 the school was firmly established. From 1864 to 1869 it was closed; in July 1869 it was reopened under George Fairfowl Macarthur (q.v.). Under his successor, St. John Gray (1886-9) the beautiful school chapel was begun, to be later completed as a war memorial. Dr. E. Harris (1889-95) raised the tone of scholarship; succeeding 'heads,' A. H. Champion, P. S. Waddy, and the present chief, E. M. Baker, have maintained the fame of a school distinguished for sport and public spirit.

In 1831 John Dunmore Lang (q.v.) energetically set about the foundation of the 'Australian College,' and the building, in Jamieson-street, Sydney, was opened in 1835. The founder's energy, however, ran ahead of his common sense, and he handicapped his college by such over-expenditure that it had to be closed in 1854, the establishment of the Sydney Grammar School being probably the determining factor in its collapse.

In 1863 the Methodist Church in New South Wales opened a school at Newington on the Parramatta River under the joint rule of a president, J. A. Manton, and a headmaster, J. E. Moulton (q.v.). In 1880 the school was moved to its present site at Stanmore, where it occupies 20 acres of land and has benefited by donations and bequests amounting to £25,000. Successive presidents were J. Fletcher (1865), Dr. William Kelynack (1887), and Dr. J. E. Moulton (1893); W. H. Williams (1884) and A. H. S. Lucas were notable headmasters. In 1900 the dual management terminated. The present head is Dr. C. J. Prescott. Newington alone of the public schools has an unbroken record of an efficient cadet corps. The average number on the roll for recent years is 320.

The Sydney Church of England Grammar School—known in the sports life as 'Shore'—stands on a fine site on the heights of North Shore and was opened in July 1889 with E. J. Robson as head. Robson was an unusually good rowing coach, and 'Shore' soon made a name on the river. He was succeeded by C. H. Hodges,

W. A. Purves, and the present head, L. C. Robson. There are 610 boys on the roll. A beautiful chapel was built in 1913, and the fine oval at Northbridge stands as a memorial to the 867 old boys who served in the great war.

Scots' College was opened in Sydney in 1893 with 25 boarders under A. A. Aspinall. In 1906 it was taken over by the Presbyterian Church. When the present head, J. Bee, came from Melbourne he found Scots' with only 54 on the roll; in five years the number had risen to 200, and in 1926 stands at 173 boarders and 152 day-boys.

While 'The King's' and 'Shore' are directly affiliated to the Church of England, there are other schools under the governance of that body; these are the Girls' Grammar School, a head school with branches at North Sydney and (wholly for boarders) at Bowral; St. Catherine's (daughters of the clergy) at Waverley; Barker College (Hornsby), the possessor of an unusually fine oval—a war memorial; Abbotsleigh (Wahroonga); Tudor House (Moss Vale); and the Church of England Grammar School at Cremorne. The Church of England has also a class of proprietary schools: Cranbrook is an outstanding example—its headmaster, F. T. Perkins, was an efficient head of Armidale (1912-18); the Church of England Girls' School at Chatswood; and Kambala (girls) on the New South Head road.

Armidale in New South Wales and Ipswich in Queensland, are notably associated with scholastic development. In 1893 The Armidale School was opened under William Fisher. It is organized as a company, but not for profit, and is a Church of England school in so far as the bishop of Armidale is its chairman of directors, the headmaster must be in holy orders, and its masters must all be members of the Church of England. In its 33½ acres are spacious playing-fields, while the Dangar House, the Maxwell library, and the scholarships are the fruits of private benefactions. A similar school is the New England Girls' School. Founded in 1895 it was at first a private school, but in 1907 was purchased by the diocese, and remains a church property. The present buildings accommodate 200 girls.

The Presbyterian Ladies' College, Croydon, was opened in 1887. Its present roll is 250; and it has been prolific of off-shoots. The Pymble Presbyterian Ladies' College, one of these, has now an enrolment of 333 (108 boarders). With 130 acres of land on the heights of North Shore, and under the management of Miss Nancy Jobson, it has a great promise of expansion. As admirably situated is the Presbyterian Ladies' College, Goulburn, founded in 1921, 2000 ft. above sea-level, and with ample space for development. The youngest of the Presbyterian foundations is Knox Grammar School, Wahroonga, with spacious grounds at Warrawee, which was founded in 1924.

In *Victoria* Scotch College is the oldest public school; it began as Melbourne Academy in 1851 under Robert Lawson in a modest building in Spring-street, a generous friend in Scotland guaranteeing the head's salary. The Presbyterian Church received a government grant of £6500, and two acres on Eastern Hill, but the enormous growth of population round that site has compelled the school to seek new quarters. In 1915 the council purchased the Hawthorn Glen estate, and in 1916 a preparatory and junior school was opened; the completion of the transfer of the school to its new home is now being effected. Over £120,000 has been expended on the new school, and the 'old boys' have contributed the cost of the senior school as a war memorial. With Scotch College must always be associated the name of Alexander Morrison, who succeeded Lawson in 1857; he holds, by one year, the record for length of tenure. His successor is W. S. Littlejohn.

A private school opened on 11 April 1849 by Richard Hale Budd, an old Rugbeian, on Eastern Hill, Melbourne, fathered two of the most important 'public' schools in that city. Budd's school, through the arrival of Dr. Perry as first bishop of Melbourne with funds to be used for education, was made the nucleus of the Diocesan Grammar School with Budd in charge. As the school was thenceforth definitely Anglican, some pupils were withdrawn, and his school thus became the feeder of both the Melbourne Grammar School and the Scotch College. The Diocesan School, established in 1849, was closed when Budd resigned in 1854; but steps had been taken to replace it by 'a College and Grammar School in connection with the Church of England.' In 1854 parliament voted £20,000 for the establishment of grammar schools, and slightly more than half that sum was handed over to the Church of England. Two years later a further sum of £15,500 was allotted, and from the total the Church of England received a little less than £21,000, of which £7000 went to Geelong, and the remainder to Melbourne. The Melbourne school was opened on 7 April 1858 with John Edward Bromby as headmaster. He was succeeded by E. E. Morris (afterwards professor at the university). The present head is R. P. Franklin, and the roll approximately 1100.

The Church of England Grammar School at Geelong, better known as 'Geelong Grammar' dates back to the first government grant 'for grammar schools.' Established first in the city, in 1912 it was transferred to Corio Bay, six miles from Geelong, a situation which has now made the school predominantly a boarding-school. At the present (1926) it has a roll of 300 boarders and only 12 day-boys. This school has been especially famous for the production of oarsmen, a number of whom have figured in the Oxford and Cambridge boat-races. The present head is F. E. Brown.

Geelong College, associated with the Presbyterian Church, opened in 1861 with 40 pupils, and won almost instant success. Three years later it was handed over to its head, and for 40 years became the private venture of George Morrison. So closely was it identified with him and his family that it was generally known as 'Morrison's.' In 1908 the school returned to Church control, and very extensive additions have been made to the buildings. Among its 'old boys' was 'Morrison of Pekin' (see MORRISON, G. E.). The present head is F. W. Rolland, M.C.

With the opening of Wesley College, South Yarra, in 1866, a third Church took up the cause of education. In 1854 the Methodists received from the government a grant of £2768 and a site of 10 acres on St. Kilda-road, and in 1866 the school was opened. Its subsequent tradition of high scholarship was mainly due to M. H. Irving, who gave up his university professorship to conduct 'Wesley.' The present head is L. A. Adamson, C.M.G., who has held the position for nearly a quarter of a century. The present roll (1926) is 523.

The oldest girls' public school in Victoria is the Presbyterian Ladies' College, Melbourne, founded in 1875, and reckoning among its chiefs Andrew Harper (afterwards of St. Andrew's

College, Sydney university) and J. P. Wilson. Its roll to-day is 600, including 100 boarders. Of its 'old girls' the most notable is Dame Nellie Melba (q.v.). Of similar status is the Methodist Ladies' College, Hawthorn, which made notable progress under the direction of Dr. W. H. Fitchett. The Church of England Girls' Grammar School, South Yarra (now under Miss Selina Jones) is of later birth, but has attained to large dimensions and the highest educational esteem.

Almost as early as the Presbyterian Ladies' College is Clarendon College, Ballarat, established in 1876; originally a proprietary school, it was taken over by the Presbyterian council in 1919. The headmistress is Miss B. L. Short. Strathcrne Presbyterian Girls' Grammar School, founded in 1889, was taken over by the Church in 1909. Fintona Presbyterian Girls' Grammar School was founded as a private school in 1896, and has become one of the largest in the Commonwealth. Most of its classes are conducted under open-air conditions. The youngest of the girls' schools of the Presbyterian body is that of Geelong, which was opened in 1920, and now (1926) has a roll of 154, including 31 boarders.

One of the oldest of the Victorian boys' schools is Ballarat College, which was founded in 1864 by William Henderson. The school flourished greatly under the long reign (33 years) of John Garbutt. In 1912 it was moved to its present site of 10 acres in Sturt-street-west. Ballarat College was represented by over 300 'old boys' in the war. The present head is A. Richardson.

Space will not permit of a detailed description, but taking the State as a whole there are to be mentioned the following:—*boys*, All Saints' Grammar School (St. Kilda), Trinity (Kew), St. Thomas' (Essendon), Berwick Church of England Grammar School (Ivanhoe), Grammar School (Malvern), Church of England Grammar School (Brighton); *girls*, Church of England Girls' Grammar School (Geelong), Firbank (Brighton), Tintern (Hawthorn), Kerowa (Malvern), Lowther Hall (Essendon), St. Michael's (St. Kilda), Church of England grammar schools at Ivanhoe and Heidelberg, and the like with addition of a special kindergarten at Shelford (Caulfield).

Queensland made secondary education a first care: within a year of her constitution as a separate State an act was passed for the establishment of grammar schools, and in 1864 an annual endowment of £1000 was granted to each school. Ten schools have been established: two in Brisbane (boys' and girls' grammar schools), two each in Maryborough, Ipswich, and Rockhampton, and one each in Toowoomba and Townsville. All grammar schools now stand on ground granted by the government, possess an endowment of £1500 per annum, and are managed by boards of local trustees. While left independent as to methods, they are regularly inspected by the department of education. This difference of system has left the way open to the churches to create their schools free of state control. Such schools must be 'approved' by the department if they are to receive holders of state scholarships from the primary schools. Of late there has been a great extension of denominational schools. Toowoomba and Warwick are following the example set by Ipswich, and becoming definitely 'scholastic' towns. Similarly there has been a quick growth in the Catholic schools and colleges.

The first of the grammar schools was Ipswich, which was opened in 1863, and numbers prominent 'old boys.' Brisbane followed with the establishment of the Brisbane Boys' Grammar School in 1869—a school which has produced many Australian men of mark. Reginald Heber Roe, scholar of Balliol in its best days, an Oxford athletic 'blue,' is one of the great names in Australian education. Under him Brisbane Grammar became foremost among Queensland schools both in scholarship and in sport.

Rockhampton Grammar also was fortunate in Wheatcroft, its first head, who, holding office from 1880 to 1905 possessed eminent scholastic gifts. Like Rockhampton, Maryborough began as a 'combined' in 1881. The boys' school now contains 40 boarders and 60 day-boys, and it has a record of three Rhodes scholars. Victor Jones is the present headmaster.

Toowoomba Grammar School occupies a particularly favourable site of 50 acres on the range, 2000 feet above sea-level. It accommodates 65 boarders, and specializes in swimming, which, like physical drill, is compulsory. Townsville Grammar School remains the 'combined' type of Queensland schools. Founded in 1888, it now has a roll of 100 girls. The climate of northern Queensland has produced an exceptional physique in 'old Townsvillians.'

The girls' grammar schools of Queensland are in constitution and curriculum duplicates of the boys'. Brisbane celebrated its jubilee in 1925; Maryborough dates from 1883; Rockhampton from 1884. Maryborough Girls' has now a valuable commercial side. The natural result of the government attitude towards higher education has been the development of denominational schools.

The Church of England has a girls' grammar school in Brisbane, a high school in South Brisbane, three schools in Toowoomba (including the Glennie Memorial School), girls' colleges at Warwick, Herberton, and Charters Towers (a combined). The Presbyterian Church has Fairholme (girls) at Toowoomba, at Warwick the Presbyterian Ladies' College and the Scots' College (boys). The Methodist Church has to a great degree associated its educational effort with the Presbyterian.

Many Queensland schools have their situation by the sea, since climate is a desiderium. Southport College has acquired high repute. Next in rank is St. Hilda's Church of England College for Girls. On Moreton Bay is the Church of England College, known throughout the State for its repute in music.

In *South Australia* there are no 'grammar schools;' all are 'high' schools directly under, and part of, governmental establishment. There are other schools that cater for secondary education, but they rank as 'public' schools, and are in varying degrees private. Of these the chief is the Church of England Collegiate School of St. Peter, commonly known as St. Peter's College, which was founded in 1847; its present fine buildings, surrounded by 65 acres of land, were occupied in 1852. Annual scholarships to the value of £1200, a valuable bequest of city property in 1869, and a war memorial hall, which when complete will cost £45,000 (fitly commemorating its 1200 enlistments in the war), demonstrate the high regard felt for this school by the people of South Australia. The present number (1926) on the roll is 700, of whom 200 are boarders. Among its headmasters have been G. H. Farr (1854-78) and H. Girdlestone, scholar and oarsman (1894-1915). The present chief is

K. J. F. Bickersteth, M.C., appointed in 1920. Its 'old boys' include leaders in many fields, of whom Sir F. Holder, Sir H. Barwell (late premier), and Sir George Murray (chief justice) may be named among prominent citizens of the State.

The Scotch College, Torrens Park, Mitcham, was established in 1919 by the purchase of a private school, Kyre College. It keeps closely to the type of other Scotch colleges in the older states. In 1922 it was incorporated 'as a public school for all time.' It has now an attendance of 300, of whom 90 are boarders.

In *Western Australia* there is yet another classification into 'schools at which secondary school scholarships are tenable,' and schools declared 'efficient.' In the first class there are the Scotch College and the Methodist Ladies' College, both in Claremont; the Presbyterian Ladies' College, Cottesloe; the Guildford Grammar School; Perth College; and Perth High School. The 'efficient' schools are many. The Church of England at Guildford was established in 1895 by Charles Harper on the lines of an English 'public' school; since 1911 it has been conducted under the presidency of the Anglican archbishop, and now has a roll of 200 boarders and 75 day-boys. Scotch College was founded in 1897, and has been highly successful; the school provides accommodation for 35 boarders, and is directly under the government of the Presbyterian General Assembly. The Wesleyan Methodist Prince Alfred College was opened in 1869.

In *Tasmania* one of the earliest foundations for secondary education was the Hutchins School in Hobart, which was opened in 1846 with J. R. Buckland as head; his son, John Buckland, succeeded him. Horton College was established in 1855 by J. A. Manton. Other schools for secondary education are the Ladies' College, and Church Grammar School at Launceston, and the Friends' High School, Hobart.

Roman Catholic Schools.—It was Bishop John Brady (q.v.) of Perth who first had recourse to his native land for Sisters of Mercy to serve the cause of education in Western Australia—'the Swan River Settlement' as it then was. The next foundation was the convent at Nicholson-street, Melbourne; and the first convent of their order was set up at Goulburn, New South Wales. From Goulburn diocese as centre, a chain of branch convents was established, the first at Albury, the latest at Young in 1923. Yass had meantime become a similar centre with a number of affiliations. These were welded together by Bishop Gallagher of Goulburn, and a central Novitiate for Sisters of Mercy was established at Goulburn. In 1912, under the registration of secondary schools, the high school was acquired and opened as 'Our Lady of Mercy College.' From St. Ethelberga's, Liverpool, Dr. Polding secured a branch sisterhood which he placed at Bathurst; but when Bathurst became a diocese, Bishop Quinn brought out nuns from Ireland, and the Liverpool sisterhood ultimately established themselves in North Sydney, Monte Sant' Angelo, and later took in the parochial schools of St. Leonards and Lavender Bay, and sent out branches to Pymble, Redfern, Chatswood, and Watson's Bay. The Sisters of Mercy at Parramatta took charge in 1888, and added a boarding and high school, which soon became a secondary school for girls. This developed into the Convent of Our Lady of Mercy, Parramatta, recognized as a 'secondary school' in 1913. Other foundations taking similar rank were at Mount St. Mary's, Newcastle, and Holy Cross, Bondi. St. Mary's, Bathurst, having risen to collegiate rank, had founded successive branches in the district—Maitland in 1875, and Singleton College for Girls, whence the sisterhood proceeded to Armidale, but transferred to Grafton. In the Lismore diocese they have now 14 schools, two of which are registered as 'secondary.'

The Ursulines are the oldest and most famous order of teaching nuns. The pioneer work of Catholic education is done by the Orders of Charity and is directly addressed to the needs of a poor population. Secondary education necessarily comes later. In the Catholic Church there is sometimes a difficulty in determining whether a given convent or monastery is doing primary or secondary work. The fact that a convent is or is not registered as a 'secondary school' within the meaning of the act proves little. Some orders will not register. The Ursuline order arrived in New South Wales in 1882, at once created at Armidale a convent offering excellent secondary education, and then spread to other States—Rosary Hill, South Brisbane; Southport, Queensland; St. Angela's, Tweed Heads; and St. Augustine's, Guyra. All Ursuline schools are 'secondary,' and their curriculum qualifies for the highest examinations under the education department, London musical certificates, and diplomas in commercial knowledge.

Of the male teaching orders, the oldest in Australia was that of the Christian Brothers of Waterford, Ireland. From the sixties the Christian Brothers have been the mainstay of Catholic secondary education throughout Australia. No finer monument to the activities of the brotherhood could be mentioned than Nudgee College, in the outskirts of Brisbane, where they have created a great public school. Christian Brothers' colleges are to be found at Gregory-terrace (Brisbane), at Coorparoo, at Toowoomba (St. Mary's, with a roll of 320), at Warwick, where a fine school was opened in 1912, at Maryborough (a flourishing school near the sea), at Ipswich, and at Townsville, where their college challenges the supremacy of the older grammar school. In Victoria the Christian Brothers opened at Melbourne in 1864 a school with a roll of 200 pupils. With Melbourne as base, they spread later to New South Wales—Balmain in 1887, Goulburn (St. Patrick's), Wagga, and Albury. A special school of this order is St. Gabriel's for the deaf and dumb. The training college for the Commonwealth is now at Strathfield. In all, this brotherhood manages in Australasia 3 orphanages, 29 secondary, 7 boarding, and 22 primary schools, with a total of 15,000 pupils. Among these is the Christian Brothers' College, Perth, one of the four great public schools of Western Australia, and the Christian Brothers' College in South Australia, opened in Wakefield-street, Adelaide, in 1883, and removed in 1922 to the beautiful Rostrevor grounds in the Adelaide hills.

The work of the Christian Brothers is by far the most widespread and effective of any order in Australia, but the three largest and best-known of the Catholic colleges belong to other orders, two to the Society of Jesus and one to the Marist Brothers. The Order of St. Benedict, which at one time aspired to rule, educationally, all Australia, has practically passed out (see BENEDICTINE ORDER). When St. Mary's Seminary fell into desuetude the brothers transferred to Lyndhurst, Glebe, Sydney, and there maintained the chief Catholic college of Australia. Lyndhurst however, which had started in 1853 with 130 students, was disbanded in

1877. The Order of St. Benedict nuns at Subiaco were for years similarly the chief training centre in Australia—'to be educated at Subiaco was the hall-mark of a Catholic lady'—and so remained for 20 years. Though from this centre the order spread to Bathurst, Maitland, and Goulburn, Subiaco lost prestige, and in 1921 became purely cloistral. The Benedictines have failed to repeat in Australia the success they have enjoyed in other lands.

The Marist Brothers, originally a French order, came to Australia in 1875 to open what is now known as the Marist Brothers' High School, Darlinghurst Sydney. Thence they extended, largely by aid of generous Protestant help, to Hunter's Hill, and in 1882 began the record of St. Joseph's, which, especially strong in boarders, had reached in 1888 the 300 mark. The present average is 350. 'Joey's' takes high rank in all forms of sport. From New South Wales the Marist Brothers rapidly extended the range of their work to other States, and in New South Wales have added colleges at Randwick and West Maitland.

An element of romance entered into the coming of the Society of Jesus to Australia. A public-spirited farmer of Silesia brought out at his own cost a party of his fellow-countrymen and founded a settlement in South Australia. Of the party whom he had benefited only two priests stood by him. With their aid he established a vineyard, and in their spare time they taught in the barn. From this humble beginning came what is now the St. Aloysius College, Seven Hills; and from this foundation at Adelaide the fame of the order spread. Bishop Gould of Melbourne brought two members from Ireland, and handed to them the College of St. Patrick's, Melbourne, which in five years became one of the leading secondary schools of the State. In 1872 St. Francis Xavier's was founded, and opened in 1878; it, too, has long been one of the 'great' public schools of Victoria. In New South Wales Bishop Vaughan purchased a splendid river property, Riverview, and in 1889 St. Ignatius, Riverview, was opened as a boarding college, with a single student. Meanwhile they lifted their day-school at Woolloomooloo to secondary status. Riverview was completed in 1890, and three years later a day-school was added. The Order of Jesus has always been devoted to the advancement of science; and the fame of Riverview rests as much upon the observatory and its able head, Father Pigot, and the later established solar radiation station (the first in the southern hemisphere) as on its rank as a school. In 1883 St. Aloysius moved from Woolloomooloo to Bourke-street, and in 1903 to Milson's Point, where it remains.

The oldest of all the teaching orders, de la Salle, was the last to establish itself in Australia. It has a secondary school, de la Salle College, at Armidale. Of isolated foundations, the most notable is St. Stanislaus, Bathurst, belonging to the Vincentian Fathers, the first foundation outside Sydney, and the oldest but one in the State. The progress and prestige of this college is largely due to Dr. Maurice O'Reilly. The Dominican Nuns have a secondary school at Moss Vale, and they have the only training-school for deaf and dumb girls. The Sisters of St. Joseph, devoted to 'bush' work, have at Mount St. Brigid, Randwick, a secondary department.

During recent years greater or less control by the State of all secondary education has been a factor in all the States, in general taking the form of registration with inspection, by way of guarantee of standard; but there has wisely been little interference with the individualism of the great non-government schools. As typical may be cited the 'bursaries endowment act' of New South Wales (1912), by which the State, with the aid of a permanent board, is enabled to classify every year those schools which reach the grade. Queensland, by its 'grammar schools act,' has always maintained a fairly close hold over secondary education, and for each grammar school four out of the seven trustees are governmental appointees. Variations of less moment are in force in other States. H.A.T.T.

Scientific and Industrial Research, Commonwealth Council for. In January 1916 the Commonwealth government created a temporary advisory council of science and industry to carry out certain initial work pending the establishment of a permanent institute. In 1920 the Institute of Science and Industry act was passed, and in March 1921 the organization was established on a permanent basis under the directorship of Sir George Knibbs (q.v.). The institute remained in existence until June 1926, but owing to its limited staff and resources its work was restricted to a few special investigations. Towards the end of 1925 the government obtained the services of Sir Frank Heath, secretary of the British department of scientific and industrial research, to report on the reorganization and development of the work, and, acting largely on his report, passed the Science and Industry Research act, 1926, and the Science and Industry Endowment act, 1926. The former placed the control of the work in the hands of a council consisting of (*a*) three nominees of the Commonwealth government, (*b*) the chairman of each State committee constituted under the act, and (*c*) other persons co-opted for their scientific knowledge. The three Commonwealth nominees form an executive committee and, between the meetings of the council, exercise all its powers and functions.

The main function of the State committees is to advise the council concerning particular matters of investigation. A sum of £250,000 was appropriated for the purpose of scientific and industrial investigations. G. A. Julius (see Totalisator, The) has been appointed chairman of the council, of which the first meeting was held in June 1926. The council has decided to concentrate its activities initially on five main subjects: (1) animal pests and diseases, (2) plant pests and diseases, (3) fuel, especially liquid fuels, (4) forest products, (5) preservation of foodstuffs, especially by cold storage. It is continuing the major researches initiated by the former advisory council and the institute of science and industry, and is engaged in the organization of investigations into the five matters specified above. Some of the more important problems concerning which investigations either have already been carried out or are in progress are:—(*a*) sheep blowfly pest, (*b*) prickly-pear pest, (*c*) pottery, (*d*) paper-pulp from Australian trees, etc., (*e*) tanning materials, (*f*) cattle-tick dips, (*g*) viticulture, (*h*) citrus fruit, (*i*) buffalo-fly pest, (*j*) bunchy-top disease in bananas, (*k*) engineering standardization, (*l*) power-alcohol, (*m*) worm-nodule disease in cattle, (*n*) freezing of beef, (*o*) *Posidonia* fibre, (*p*) tuberculosis in stock.

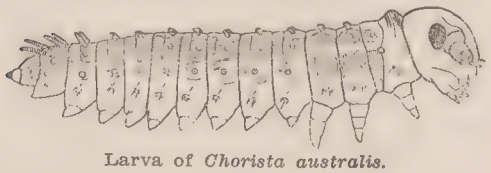
Under the science and industry endowment act the government has established a capital fund of £100,000, the income from which is to be

used to provide assistance (*a*) to persons engaged in scientific research, (*b*) in the training of students in scientific research. Provision is made for gifts or bequests to the fund, which is controlled by a trust consisting of the three Commonwealth nominees on the council. Under this act arrangements have been made to send a number of qualified graduates abroad for training in special fields of work. G.L.

Scissors-grinder. See FLYCATCHERS.

Scorpion-flies, vernacular name of insects of the order Mecoptera, of which fewer than 200 species exist in the world to-day, and only about a dozen in Australia. Both by their fossil record and their structure these insects are proved to be of very ancient descent; indeed, they may well be the oldest type of holometabolous insects now in existence. The extinct genus *Permochorista*, remains of which are found in the upper coal-measures at Newcastle in New South Wales, differs little from the existing Choristidae, which are peculiar to Australia.

The order gets its vernacular name from the fact that males of the genus *Panorpa*, dominant in the northern hemisphere, carry the end of the abdomen (which is furnished with a pair of large forceps) turned forwards over the back of the segments preceding it, thus simulating the scorpion's method of carrying its sting. The fly, however, is quite harmless and, being of weak flight, may easily be caught with the hand. Most of them feed upon dead insects, but also show a taste for the anthers of certain flowers, such as the tea-tree (*Melaleuca* spp.). The head is provided with a prominent beak, which either carries the mouth-parts at its tip (as in most families), or is actually formed by the elongated mouth-parts themselves (as in Bittacidae). The fore- and hind-wings are sub-equal, elongated, and provided with a considerable number of cross-veins, arranged so as to divide most of the wing into elongated cells of rather large size.



Larva of *Chorista australis*.

The larva is a caterpillar of very primitive type, possessing compound eyes and jointed antennae, together with a pair of abdominal legs upon every one of its nine abdominal segments. This creature feeds upon dead insects and vegetable debris, and becomes rapidly full-fed, when it burrows into the ground and forms an earth-cell. Here it rests for the greater part of the year, finally changing to a free pupa, which emerges a week later as an imago. The text-figure shows the larva and pupa of *Chorista australis*.

Pupa of *Chorista australis* (female).

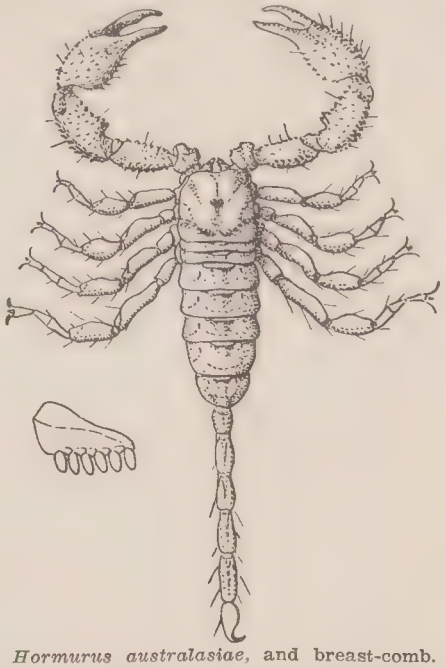
Three families are represented in Australia, the Choristidae, Nannochoristidae and Bittacidae. The first contains four or five very rare species, which emerge in the autumn and are seldom seen by collectors. *Chorista australis* (plate xix, fig. 20) is the best-known species. The Nannochoristidae contain four very rare species, confined to Tasmania and high altitudes on the mainland. They are very small, and, except for their four wings, resemble delicately-built Diptera. The best-known is *Nannochorista dipteroides*.

The Bittacidae are more abundant, and appear in the spring. The commonest species is *Harpobittacus tillyardi*, which at first sight resembles a large crane-fly, but is much more strongly built. It may often be seen carrying off insects almost as large as itself; these it seizes with its hind-legs, which are so constructed that they can be held forward and used as a pair of hands. The captured insect is pierced by the beak of the panorpid, and is sucked dry at leisure. The species of this family lay peculiar cubical eggs, and their larvae do not possess pro-legs.

See Sharp in the *Cambridge Natural History*, and Tillyard's 'Studies in Australian Mecoptera' in the *Proceedings* of the Linnean Society of New South Wales, 1917-8. R.J.T.

Scorpions, vernacular name of an order (Scorpionida) of the class Arachnida (q.v.), easily distinguished from the rest of their class by their largely developed pedipalps and slender post-abdomen or tail, the latter furnished with a sting. The body is divided into two major parts, the cephalothorax (carapace) and the abdomen; to the former are attached the pedipalps and the eight legs. The coxae of the pedipalps are fitted for crushing prey, which is seized by the large chelae. The legs are seven-jointed, and the tarsus consists of three segments.

The abdomen is divisible into two parts, the pre- and the post-abdomen; the former is broad, with seven segments, the latter (the tail) has five segments and a sting, and is always more or less keeled. On the under-side, beneath the second abdominal segment, are the pectines—comb-like appendages with teeth whose number varies not only in different species, but also in



Hormurus australasiae, and breast-comb.

different individuals of a species; e.g. *Hormurus australasiae* has never more than six,

sometimes five, and occasionally four; in *H. caudicula* the number varies from six to nine; *Archisometrus marmoreus* may have as many as 20 in the male and 13 or 15 in the female. The function of these appendages has not yet been determined, but is probably tactile. Pocock noticed a scorpion walking over a cockroach; when it had progressed far enough for the pectines to come into contact with the cockroach, it immediately backed and ate its victim.

The sexes are distinguished by the hand, fingers, and post-abdomen, the first being wider, and the last longer, in the male. The eyes vary in number. There is a pair (known as median eyes) near the middle line of the cephalothorax, and a group of from two to five on each side near the cephalo-lateral margin. None of our scorpions are blind, as are some exotic forms. They breathe by means of four pairs of book-lungs, opening on the lower side of the third and the next three abdominal segments. They are viviparous; after birth the mother carries her young about for some time, the babies clinging to the parent by their pincers. According to Fabre, who studied these creatures in confinement, an individual takes five years to reach maturity.

Of shy and nocturnal habits, hiding by day in dark places, scorpions are not often seen. When disturbed they will run away and hide, and will not attempt to sting unless interfered with. Their food consists of spiders and insects. The alleged power of the sting is much exaggerated; it has no effect upon the animal itself, or even upon a closely allied species. Little is known as to the toxic effects in the case of any of our endemic scorpions. According to Castellani and Chalmers, the most reasonable treatment is to apply a proximal ligature, to excise and treat the wound with permanganate of potash or a weak solution of ammonia, and to give stimulants.

About 20 Australian species have been recorded, six from the family Buthidae, ten from the Scorpionidae, and four from the Bothriuridae —the two last-named families containing the largest forms. For the arachnids usually known as 'false scorpions' see PSEUDO-SCORPIONS.

See Keyserling in *Die Arachniden Australiens* (1884); Pocock in *Annals and Magazine of Natural History* (*passim*); Fabre's *The Life of the Scorpion*; and the *Cambridge Natural History*.

W.J.R.

Scott, ROSE (1847-1925), born at Glendon near Singleton in New South Wales on 8 October 1847, was the daughter of Helenus Scott and a cousin of G. W. Rusden (q.v.), the historian, and of David Scott Mitchell (q.v.), donor of the Mitchell Library. She first came into public notice in 1889 as one of a band of women who formed a Women's Literary Society at Sydney; at a meeting of this society Maybanke Wolstenholme strongly advocated women's suffrage, and shortly afterwards, on 6 May 1891, a Womanhood Suffrage League was formed, of which on 4 June Rose Scott was appointed honorary corresponding secretary. Women's suffrage had of course been advocated previously by others, but the formation of this league was the first practical step towards securing the vote. The duties of the corresponding secretary were onerous. Handwritten circulars were sent to all members of parliament; the mass of letters to and from sympathizers and kindred bodies in other colonies, England, and the United States, became enormous; public meetings had to be addressed, and legislators and editors of newspapers interviewed. In 1902, after 11 years of this unremitting labour, Sir William Lyne put a woman's suffrage act through the New South Wales parliament.

The league, having achieved its object, was dissolved on 8 October 1902, and was succeeded on the 22nd by a Women's Political Educational League, of which Rose Scott was elected president. The object of this league was to educate women in the use of their vote, and the president threw herself into the work on non-party lines. She herself always eschewed 'party' politics, but when women became politically conscious they naturally took sides, and the league ceased to exist in 1910.

Even before the formation of the Womanhood Suffrage League Rose Scott had begun to interest herself in other legislative reforms. From 1891 onwards she devoted herself to the improvement by legislation of the position of women and children. One of the earliest statutes in which she was interested was the children's protection act of 1892, which regulated the conditions under which children under three years of age might be adopted, and penalized the employment of children under 14 years of age in dangerous performances. The custody of children act of 1894 gave the courts a wider discretion, and the factories and shops act of 1896 provided among other things that no child under 13 should be employed in factories, and none under 14 without the special leave of the minister; and that no male under 16, and no female, should be employed in factories for more than 48 hours a week, except for a limited overtime. The early closing act of 1899 limited the hours during which shops might be kept open. The state children relief act of 1901 provided for the payment of expenses by the father of an illegitimate child before birth of the child, and for the hearing of such cases in a 'children's court.' Children's courts were more formally established by the neglected children and juvenile offenders act of 1905. By the crimes (girls' protection) act of 1910 the 'age of consent' of girls in sexual offences was raised from 14 to 16. The testators' family maintenance and guardianship of infants act of 1916 orders that, where no adequate provision is made for a testator's family, the court may make provision out of his estate; makes a mother guardian of her children on the death of the father; and gives her power to appoint a guardian after the death of herself and the father.

Rose Scott was one of the leaders among the many men and women who effectively advocated these measures. Distinguished for charm and gentleness of manner, she had also an intense zeal for the causes which she advocated, and a great capacity for work. Her life, like that of Maybanke Anderson, is a striking instance of what may be accomplished by a private citizen inspired by a zeal for humanity.

She was a strong opponent of federation, and in later years of conscription. She was president of the Peace Society from the time of its formation in 1907, and international secretary of the National Council of Women of New South Wales, formed in 1896. In 1924 her portrait in oils by John Longstaff was purchased by subscription and presented to the Commonwealth Portrait Gallery. She died at Woollahra, New South Wales, on 22 April 1925. T.R.

Scott, THOMAS HOBBES (1773-1860), born in Northumberland in 1773, is first heard of as a wine-merchant who on 11 October 1813—at the age of 40—matriculated at Oxford (M.A.,

1818). In January 1819 he was appointed secretary to John Thomas Bigge (q.v.) with the right to take over the work if Bigge fell ill or died. In the quarrel between Macquarie and Bigge, Scott acted as mediator and in February 1820 effected a nominal reconciliation between them. Returning to England in 1821, he took holy orders, and in 1822 became vicar of Whitfield in Northumberland. In 1824 New South Wales was raised to an archdeaconry, and on 2 October Scott received the appointment at a salary of £2000 a year and expenses. He reached Sydney in the *Hercules* on 7 May 1825, took up his duties on the 10th, held his first visitation in St. James's church on 6 June, and in January 1826 visited Tasmania for the same purpose. His previous association with Bigge made him unpopular and his own temperament brought him into collision with many important persons—Governor Brisbane over Church land at Camden, E. S. Hall (q.v.), C. P. N. Wilton over financial transactions, Dr. Douglass on a question of flogging convicts, W. C. Wentworth, and others. This persistent quarrelsomeness led to his resignation on 14 November 1828, and he left the colony on 18 October 1829. On his way home, in January 1830, he assisted the settlement at Swan River to organize Church services. Returning to England, he took up again his work at Whitfield, became honorary canon of Durham cathedral in 1854, and died on 1 January 1860.

J.V.C.-B.

Scott, WALTER (1854-1925), born in Somersetshire, England, in 1854 and educated at Christ's Hospital and Balliol College, Oxford (B.A., 1878; M.A., 1884), gained while an undergraduate the Ireland, Craven, and Derby scholarships and in 1879 was made a fellow and tutor of Merton College. In 1885 he migrated to Sydney as Dr. Badham's successor in the chair of classics at the university; in 1890 the chair was divided, and Scott became professor of Greek. In 1885-94 and 1896-8 he was dean of the faculty of arts and a member of the senate. In 1900 his continual ill-health forced him to resign his chair and return to England with the rank of professor emeritus; some years later he was able to hold for a short time the chair of classics at McGill university, Montreal, but soon returned to Oxford and lived there, busying himself with classical researches, until his death on 26 February 1925.

Scott's most important achievement at Sydney was his share—by far the greatest—in the establishment of (*a*) chairs of modern literature, history, and philosophy in the university, (*b*) the women's college, (*c*) a system of university extension lectures which during his time chiefly affected the country districts and to some extent anticipated the work of the more modern tutorial classes (see UNIVERSITIES). His personal influence was not so far-reaching as Badham's, mainly because of his natural shyness; but on all who came into close contact with him it was irresistible. Apart from his university work he edited *Fragmenta Herculanensia* (1885), which placed him at once among the first scholars of Europe as an authority on Epicureanism; he devoted many years to the study of Etruscan inscriptions; and before he died he published the first volume of an edition of the works attributed to 'Hermes Trismegistus' which is admittedly the final word (for several generations at least) on those important but remarkably obscure writings.

C.B.

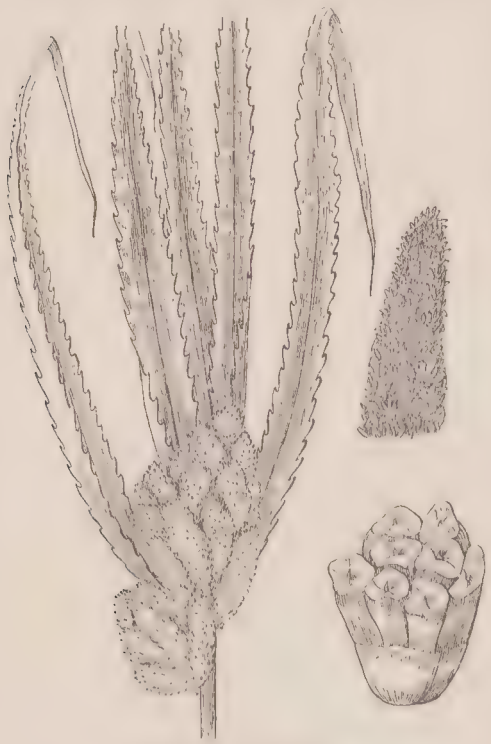
Scottish Martyrs. See MUIR, THOMAS and PALMER, THOMAS FYSH.

Scratchley, SIR PETER HENRY (1835-1885), born in Paris on 24 August 1835 and educated there privately, entered the royal military academy at Woolwich and on 11 April 1854 was commissioned second lieutenant in the royal engineers (1st lieutenant, 1854; captain, 1859; major, 1864; lieutenant-colonel, 1874; major-general, 1882). He saw active service in the Crimea (1855-6) and in India during the Mutiny (1857-9), and in 1860 was selected to superintend the erection of defence-works in Victoria. There he not only carried out a sound scheme of defence for Hobson's Bay but trained a local volunteer engineer force and devised a general defence-scheme for Port Phillip—which was, however, rejected by James McCulloch when he became premier in 1863; Scratchley therefore returned to England and was in 1864 made director of construction for the war office and given charge of important works at Woolwich, Enfield, and Shoeburyness. In 1876 he was chosen by the colonial office to assist Sir William Jervois (q.v.) in planning a general defence-scheme for Australia; when in October 1877 Jervois became governor of South Australia, Scratchley was made commissioner of defences in the five eastern colonies, and in spite of the hampering effect of political changes managed to design and construct the harbour defences of Sydney (including Botany Bay) and Newcastle, greatly improve those of Port Phillip and Hobart, and effect some improvement at Adelaide and Brisbane. In 1883 he returned to England, and was made adviser on defences for the same five colonies. In November 1884 he was appointed high commissioner for the newly-created New Guinea protectorate (see PAPUA), during January-July 1885 consulted with the colonial governments about their assistance towards the financing of his government, and in August reached Port Moresby and began to organize an administration. During his travels in the island, however, he contracted malaria, and died at sea on his way back to Australia on 2 December 1885. (C.M.G., 1879; K.C.M.G., 1885.)

See Kinloch Cooke's *Australian Defences and New Guinea*, which is a compilation from Scratchley's papers with a memoir of him.

Screw Pine, a name popularly given to several species of *Pandanus*, a tropical genus belonging to the family Pandanaceae. Only one of the species, *P. pedunculatus*, extends as far south as Port Macquarie in New South Wales. The flowers, which have neither sepals nor petals, are unisexual on separate plants, the males in large numbers on a series of short catkin-like spikes, the females closely packed in globular heads. The fruit consists of a number of drupes crowded in the head; leaves long, leathery, and spreading, prickly on the margins and often in the midrib, usually in tufts at the ends of the branches in a series of spirals. Four species occur in Queensland, two of which—*P. odoratissimus* and *P. aquaticus*—extend round the northern coast to north-western Australia. Their stilt-roots are characteristic. The name 'pines' is due to the fact that their fruits are supposed to resemble those of the pineapple; in some districts of Australia they are known also as 'breadfruit,' but the nutriment obtainable from them is usually too scanty to be appreciated by anyone except an aboriginal. Of *P. odoratissimus* (which he calls *P. spiralis*) Leichhardt says in his diary

for September 1845, while between the Robinson and Macarthur rivers: 'the natives, at this season, seemed to live principally on the seeds of Pandanus spiralis, and Cycas; but both evidently required much preparation to destroy their



Pandanus odoratissimus, flower, and seed.

deleterious properties.' (*Overland Journey*, p. 406). The preparation consisted of baking the cones in hot ashes, soaking them in water, and then roasting them till they could be broken up to extract the seeds. In India the yellow pulpy part of the drupes and the tender white bases of the leaves are eaten, either raw or boiled, in times of scarcity. In Ceylon the leaves are made into mats, baskets, and hats. The leaf-fibre is well adapted for making a good quality of paper, and for sacking. The fibrous aerial roots are used as paint-brushes.

Scrophulariaceae, a large family of herbs (rarely shrubs), frequently with showy flowers, dispersed over every part of the globe. Twenty-two genera and 86 species are indigenous to Australia. *Mimulus* has 4 indigenous species; *M. repens* (Creeping Monkey-flower), a prostrate herb, with pretty blue flowers with a yellow centre, is closely related to *M. moschatus* (Musk). *Euphrasia*, the eye-bright of Europe, is a small group of herbs, several endemic species of which are confined to the higher elevations of the Australian Alps and of Tasmania. A decoction made from the endemic mud-creeping herbs *Gratiola pedunculata* and *peruviana* (Brooklime) is often used in country districts as a purgative. See VERONICA.

Scrub-birds, small terrestrial birds of the family Atrichornithidae, peculiar to Australia. The family contains a single genus, *Atrichornis*, with two species, the Noisy Scrub-bird (*A. clamosa*), inhabiting the karri-forests of south-western Australia, and the Rufous Scrub-bird (*A. rufescens*), found in the semi-tropical scrubs of southern Queensland and on the northern rivers of New South Wales.

Scrub-birds differ in many structural characters from all other perching birds, and are by some authorities regarded as near relatives of the lyre-birds. Their terrestrial habits, shyness, strong legs used for scratching, loud calls, and capacity for mimicry, all support this view. Their wings are much reduced, and they are able to fly only a few yards at a time. They are very secretive in habit, running about in the tangle of creepers among fallen timber in the thickest and darkest parts of the scrub. In coloration they are rufous-brown, with white throats. The nest is dome-shaped, and is placed on the ground among dense vegetation.

Though the male noisy scrub-bird was first described in 1844, and the male rufous scrub-bird in 1866, it was not until 1919 that a female of the latter species was obtained (by Sidney William Jackson, in the Macpherson ranges); that of the former is still unknown. As the noisy scrub-bird is almost (if not quite) extinct, it is probable that the hen-bird will never be discovered.

W.B.A.

Scrub Fowl. See MOUND-BIRDS.

Scrub-robins. See GROUND-BIRDS AND SCRUB-ROBINS.

Scrub-tit. See SCRUB-WRENS.

Scrub Turkey. See MOUND-BIRDS.

Scrub-wrens, small, comparatively dull-coloured perching birds, with short tails, peculiar to the Australian region. The majority of the species belong to the genus *Sericornis*, which occurs in Australia, New Guinea, and the Aru Islands. Two other closely related genera, *Pyrrholaemus* and *Oreoscopus*, are found in Australia, and a third, *Acanthornis*, in Tasmania. The scrub-wrens are usually placed in the warbler family Sylviidae, and are undoubtedly near relatives of the Australian tits (*Acanthiza*)—probably also of the ground-wrens and field-wrens (*Hylacola* and *Calamanthus*). For the most part they inhabit well-shaded and well-watered gullies, or thickets of bushes, and utter pleasing but simple notes. Their food consists of small

Yellow-throated Scrub-wren (*length* 5½ *in.*).

insects. They build dome-shaped nests, composed of moss, fern, roots, or grasses, and lined with feathers or hair, sometimes suspended in the bushes, sometimes close to the ground in a tussock or beneath a shrub.

Of the nine species of scrub-wren found in

Australia three are confined to the scrubs of the eastern coast. These are the Yellow-throated Scrub-wren (*Sericornis lathami*), White-browed Scrub-wren (*S. frontalis*), and Large-billed Scrub-wren (*S. magnirostris*). Two are peculiar to Tasmania, the Brown Scrub-wren (*S. humilis*) and the Scrub-tit (*Acanthornis magna*). Two, the Northern Scrub-wren (*S. tyrannula*) and the Fern-bird (*Oreoscopus gutturalis*), are only found in Queensland; one, the Spotted Scrub-wren (*S. maculata*), is peculiar to southern and south-western Australia; and one, the Redthroat (*Pyrrholaemus brunneus*), is an inhabitant of the inland districts of the southern States.

W.B.A.

Sculling. See ROWING AND SCULLING.

Sculpture. See ART, GILBERT, WEB, and MACKENNAL, SIR BERTRAM.

Sea-anemones, the popular name of several genera of Actinozoa, a class of Coelenterata comprising polyps without a medusoid stage, and with a gullet and vertical partitions in the enteron. On account of their great beauty of form and their vivid and varied tints they are in all countries among the most attractive animals of the seashore. Along the Australian coast the commonest species is the Crimson Sea-anemone (*Paractis papaver*). It chooses dark corners or the under-side of rocks, to which it attaches its broad base. From this rises a short, smooth column, surrounded at the top by numerous tentacles, which are arranged in several series and when outstretched have a spread of nearly two inches. The tentacles, being used for the capture of food, are provided with stinging-cells, which, like those of hydroid zoophytes (q.v.), form a powerful offensive and defensive apparatus; they can be completely retracted, and the animal, when molested, or when exposed at low tide, can contract to a small fleshy knob. The anemone feeds almost entirely on living animals; any small fish or crustacean coming within its reach is seized by the tentacles, paralysed by the stinging-cells, and swallowed entire. Although usually attached (by means of a sticky secretion from the base) to rocks, shells, etc., sea-anemones can shift their position by slow, gliding movements of the lower extremity; more rarely locomotion is effected by means of the tentacles, which are used as feet. In aquaria, tracks half an inch wide and about nine inches in length have betrayed the sea-anemone's movements during the night.

Along the edges of grooves in sandstone rock exposed at low water is to be seen another sea-anemone (*Oulactis mucosa*), which prefers a crack into which it can withdraw when disturbed. It enjoys the fullest exposure to the light, and expands to a diameter of three inches. The column of this sea-anemone is beset with papillae, and fragments of stone and shell adhering to them clothe the column with an almost continuous coat. Though a fine species for temperate latitudes, it is a pigmy compared with some sea-anemones. The Great Barrier Reef produces giant species, which may measure from 18 inches to two feet across their expanded disks, and are harbours of refuge for fish and crabs. The anemones are themselves bright in colour, but the associated fish are even more so. On the Western Australian coast an anemone has been seen which was olive-green, with the tips of the tentacles bright mauve; the fishes sheltering in it were orange-scarlet, with white bands. In addition to the fish a small flat-clawed crab shared the anemone's hospitality. Some of these tropical reef-frequenting anemones have their tentacles beautifully branched, but must be cautiously handled in consequence of their notable stinging properties.

Most sea-anemones are temporarily attached by the base; some forms, however, usually live partly buried in the sand; others again (such as *Peachia*) live an active, free life. A species of *Peachia* found on the coast of New South Wales passes the early stages of its development within the large jelly-fish *Crambessa*, so common in landlocked harbours along the coast. Among other species constantly taken in association with other marine animals is one (*Adamsia*) always found on a shell inhabited by a hermit-crab; and certain tropical crabs carry in each claw a living sea-anemone, and use it as a weapon.

See Saville-Kent's *Great Barrier Reef of Australia*, and articles by Hill and Whitelegge in the *Memoirs* of the Australian Museum, Badham in the *Quarterly Journal* of the Microscopical Society of London, Wilsmore in the *Journal* of the Linnean Society of London, and Haddon and Shackleton in that of the Royal Society of Dublin.

E.A.B.

Seablite. See CHENOPODIACEAE.

Sea Bream. See TREVALLY.

Sea-coast Laburnum. See SOPHORA.

Sea-cucumber. See ECHINODERMATA.

Sea-dragon. See SEA-HORSES.

Sea-gulls. See GULLS, TERNS, AND SKUAS.

Sea-horses. The family Syngnathidae is comprised of a large number of extraordinary fishes commonly known as sea-horses and pipe-fishes. They are abundantly represented in Australian waters, and some of the most remarkable species are restricted to them. The body is enclosed in a hard, jointed armour of horny plates, and the head is produced into a long, tube-like snout; the fins are very small and feeble, and the fish can move only very slowly. The tail-fin is usually absent, and the tail itself often serves as a prehensile organ with which the fish cling to the weeds among which they live. The males are usually provided with a pouch of skin on the under surface of the body or tail, in which the eggs are carried until they hatch; in those species which have no such pouch, the eggs are fastened to the abdomen or tail by a sticky secretion. The most

Leafy Sea-horse (*Phyllopteryx eques*).

remarkable members of the family are the leafy sea-horses or sea-dragons (*Phyllopteryx*), decorated with chitinous outgrowths so closely resembling the leaves of sea-weeds that they

effectively disguise the fish and hide them from hostile observation. These and their allies the spiny sea-horses (*Solegnathus*) are often washed up on the beaches of southern and south-eastern Australia and Tasmania after storms; the common sea-horses (*Hippocampus*) and the pipefishes (*Syngnathus*) are usually observed in fishermen's nets that have been hauled among weeds. All the Syngnathidae have very small mouths, and subsist largely upon minute crustaceans which crawl over the weeds of the sea as do insects over those of the land.

A.R.McC.

Sea-lilies. See ECHINODERMATA.

Sealing. See WHALING AND SEALING.

Seals. The sub-order Pinnipedia of the mammalian order Carnivora is represented in the Australian fauna by four or five species of seals only; these are the Australian Sea Bear (*Arctocephalus doriferus*), with Forster's New Zealand Sea Bear (*A. forsteri*), the Australian Sea Lion (*A. cinereus*), the Sea Leopard (*Ogmorhinus leptonyx*), and the Crab-eating Seal (*Lobodon carcinophaga*). The first three belong to the eared seals, the last two—which are only casual visitants—to the earless. The Sea Elephant (*Macrorhinus leoninus*) seems to have formerly abounded on King Island and other islands in Bass Strait, but has now disappeared from Australian waters.

The Australian sea bear, one of the fur seals, in the early days of white settlement in Australia frequented in large numbers the islands of Bass Strait and various other localities on the Victorian and New South Wales coasts. Its numbers are now so reduced, as a result of the activities of seal-hunters, that it is quite a rare animal in Australia. Western Port in Victoria, and the Seal Rocks north of Newcastle in New South Wales, are two of the few localities in which it is still to be seen. The killing of this and other seals in Australian waters is now forbidden by law under a heavy penalty, and they are not likely to become actually extinct.

The full-grown male sea bear is a large, bulky animal, 7 or 8 feet in length; the females are about 5½ feet. When out of the water they can move about actively, the hind-limbs (as in all eared seals) being capable of being bent forward so as to aid in the support of the body. Adult males are dark-brown above, rich chestnut below and on the limbs and tail; females are lighter in colour.

According to A. S. Le Souef (*Australian Zoologist*, iv, part 2, 1925, page 113) the New Zealand fur seal (or sea bear) occurs on King Island in Bass Strait, and on the Recherche Archipelago in south-western Australia. It is somewhat smaller than the typical Australian form, and has smaller and smoother teeth, and molars which are not provided with the strongly-marked anterior and posterior secondary cusps found in *A. doriferus*; there are also minor external differences.

The Australian Sea Lion (*Arctocephalus cinereus*), one of the hair seals, occurs along the coasts of South and Western Australia as far west as Houtman's Abrolhos, but is not now abundant anywhere except in the Recherche Archipelago. Adult males reach 10 feet in length. The face, front and sides of the neck, as well as all the under-surface, sides, and back, are blackish-brown, passing into dark slaty-gray on the extremities of the limbs; the hinder half of the crown and nape and back of the neck are a rich, deep fawn-colour. The names used for the local species are those advocated by Professor Wood Jones.

Of earless seals two species only are known to visit Australia. One is the Sea Leopard (*Ogmorhinus leptonyx*), whose home is in the Antarctic seas, where it occurs in enormous numbers, only occasional stragglers visiting the southern Australian coasts. As in other earless seals, the hind-limbs are incapable of being bent forward to assist in locomotion on land. Its name is derived from the presence of numerous irregular spots of varying size and tint, distributed over the surface. Full-grown males may be 10 feet long. The other is the Crab-eating Seal (*Lobodon carcinophaga*), two specimens of which are recorded as having come ashore in Victoria (one at Portland, the other at St. Kilda) in recent years. See WHALING AND SEALING.

See A. W. Scott's *Mammalia Recent and Extinct* (1873); J. D. Ogilby's *Catalogue of Australian Mammals* (1892); McCoy's *Prodromus of the Zoology of Victoria* (1885-90); Lucas and Le Souef's *Animals of Australia* (1909); and Wood Jones's 'The Eared Seals of South Australia' in the *Records* of the South Australian Museum (iii, 1, 1925).

W.A.H.

Seals and Armorial Bearings. The use of seals by persons of importance dates from a remote antiquity. In ages when the art of writing was far less widespread than is, say, the knowledge of shorthand to-day, and when men at the head of affairs, whether public or private, great or small, employed scribes to make out all necessary documents and needed some sure means of assuring the readers and recipients that those documents had their personal approval, the use of a seal—i.e. a means of attaching some mark belonging to or peculiarly associated with the person in authority—was extremely useful and indeed almost essential. Armorial bearings, though much later in origin—there is no evidence of their deliberate use before the middle of the twelfth century—had a somewhat similar purpose; they served to distinguish a knight, his dependants, or his possessions among the crowds of similarly accoutred knights, etc., that made up feudal armies. Their use as memorials of brave deeds or of honourable intermarriages was a later development. In modern times, of course, both seals and armorial bearings have become honorific luxuries. Seals are now chiefly used by corporate bodies—states, cities, etc.—to add dignity and solemn assurance to the written evidence of their decisions. Armorial bearings (properly used) are either evidence of descent from notable families of the past, or tokens that some personal achievement has received its merited approbation in high quarters. Unfortunately the authorities who have been allowed to grant coats of arms have in too many cases relaxed the conditions of their grants overmuch, and the possession of a coat of arms has become evidence of mere vanity rather than of legitimate pride. With such cases, however, this article is not concerned, as it deals only with the seals and bearings of public bodies in Australia, and of one great man.

Seals.—New South Wales, the first-founded colony, has had no fewer than eight seals in the course of its existence. The first, granted by King George III, was brought out by Lieutenant-governor King, and was received in Sydney on 22 September 1791. There being no sealing-wax

in the colony at the time, impressions were roughly made on gray sugar-paper covered with paste; according to W. A. Gullick, no impression of the reverse side of this seal has ever been found. A description of it is as follows:—

Obverse: convicts being landed at Botany Bay, their fetters are taken off, and they are received by Industry, sitting on a bale of merchandise, surrounded by a spinning-wheel, beehive, pick axe, and a spade. She points to oxen ploughing, buildings being constructed, and a church in the distance, with a fort for defence. The motto is, *Sic Fortis Etruria Crevit*; round the circumference is *Sigillum Nov. Camb. Aust.* (the seal of New South Wales).

Reverse: the Royal Arms, supporters, garter, imperial crown and motto, the royal titles round these.

Seal No. 2 was granted by the prince regent, afterwards George IV. It was received in November 1817, but no example has been discovered. No. 3, granted by George IV, is identical with the first except as regards the king's name; it was in use from 1827 to 1832. No. 4, granted by William IV, was in use from 1832 till 1839. It was one-sided, combining both sides of No. 1.

No. 5, granted by Queen Victoria, was received in 1839 and remained in use till 1870. This was also a one-sided combination, with the omission of the motto 'Sic Fortis Etruria Crevit.' No. 6, granted by Queen Victoria, was received in November 1870, and remained in use till 1905. Transportation having ceased in 1853, the convict group was at length omitted, and replaced by a golden fleece and two ostrich feathers with the motto 'Ich dien.' No. 7, granted by King Edward VII, was received in February 1905, and was in use till 1912. It was identical with No. 6, except for the monarch's name.

No. 8, granted by King George V, was received in June 1912, and has been in use since 3 July of that year. It shows the arms of New South Wales, with motto, supported by the lion and kangaroo; above, in a spray of rose, thistle, and shamrock, is the royal coat of arms encircled with the garter, and the royal motto beneath the imperial crown. Round all this runs the legend GEORGIUS V D:G: BRITT. ET TERRARUM TRANSMAR: QUAE IN DIT: SUNT BRIT: REX F:D: IND: IMP: NEW SOUTH WALES, the last words being at the bottom of the circle. W. A. Gullick (from whose monograph on the seals of New South Wales the above description is condensed) adds:—'A point to be noted in these matters is the carefully graduated recognition of status indicated on our State Seals. As the constitutionally ascending steps have been achieved, so they have been armorially recognized. With the first penal settlement stage came the bestowal of the old seal, with its convict emblems; next all these were swept away with the advancing status of the colony, and later (November 1905), the State was asked to make a local choice of arms, which when claimed, were granted and enrolled "to be borne for the said State on seals, shields, banners, flags, or otherwise according to the Laws of Arms."'

A small governor's seal was in use from 1791 till 1914. The present governor's seal came into use at the beginning of 1925. It is similar to No. 8, with the circumscription 'Governor of New South Wales.'

Other official seals are in use in the State, such as that of the premier, and those of the various departments. The university of Sydney, several ecclesiastical bodies, and the various municipalities, also have seals. The seal of the corporation of Sydney contains the arms granted to the city in 1908, surrounded by the words 'The Municipal Council of Sydney, 1842.'

The seal of the State of Queensland shows a lion and kangaroo supporting two shields, one of the royal arms, the other of the Queensland arms, crest, and motto of arms; below, a banana-palm in fruit, sheep, lambs, a man ploughing, and factory-chimneys in the background; the inscription is identical with that of No. 8 of New South Wales, except for the name of the State. The seal of the city of Brisbane is similar to its arms, described below.

The seal of the State of Victoria resembles No. 8 of New South Wales, but has sheep under the royal arms; the inscription is the same except for the words 'State of Victoria.' The seal of the city of Melbourne is similar to its arms, but has a circumscription 'City of Melbourne incorporated A.D. 1842.'

The seal of South Australia also resembles No. 8 of New South Wales, except that under the royal arms a magpie is displayed inside an ornamental border having three stalks of wheat on each side; the inscription differs, of course, in the name of the State. This seal came into use in 1903. The seal of the city of Adelaide is the same as the city arms.

The seal of the State of Western Australia resembles No. 8 of New South Wales, but has below the royal arms a swan amongst reeds, with the motto 'Cygnis insignis.' The State's name is, of course, inserted. The seal of the city of Perth is similar to the arms used by that city, but is encircled by the words 'City of Perth, Western Australia;' below on a ribbon is the word 'Floreat.'

The seal of the State of Tasmania resembles No. 8 of New South Wales, but has below the royal arms a group of three persons, two standing, one reclining on the ground. The inscription differs by the insertion of the words 'Tasmaniae Sigillum.' The seal of the city of Hobart is similar to the arms used by the city, but is surrounded by the words 'Corporation of Hobart.'

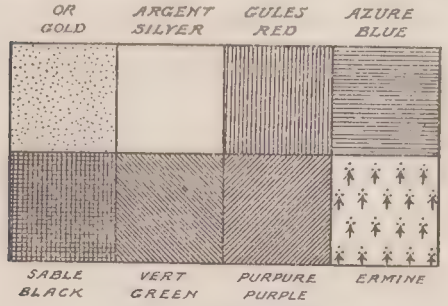
The office of governor-general of the Commonwealth was constituted by letters patent dated 29 October 1900, which include provision for a Great Seal for the Commonwealth; until one could be made, the private seal of the governor-general must be used as the Great Seal. The Earl of Hopetoun, the first governor-general, therefore lent for this purpose his private seal, engraved with his arms, which were:—

Azure on a chevron or, between three bezants, a bay-leaf slipped vert; crest, a globe fracted at the top under a rainbow with clouds at each end, all proper; supporters, two female figures in loose garments and with hair dishevelled, each holding in the exterior hand an anchor, all proper; motto, 'At spes non fracta.'

The arms of Lord Hopetoun and of his successor Lord Tennyson so applied, those of Lord Sydney's family, part of Captain Cook's and those of Hughes (contained in the arms of the city of Sydney) are the only private armorial ensigns which have so far been officially employed in Australia. The Hopetoun seal was in use from 29 October 1900 till 18 July 1902, and the private seal of Lord Tennyson thence till 21 January 1904. On that date a Great Seal prepared in 1903, and granted by Edward VII, came into official use. Its continued employment after King Edward's death was authorized by

royal warrant of King George V, dated 26 May 1910, but a new seal was prepared in 1912, and is now in use. It shows the royal arms surmounted by an imperial crown, round which are the badges of the different States treated as arms, on shields having their bases towards the centre of the seal. The badge of Queensland, however, which is a Maltese cross bearing upon its centre an imperial crown (part of the State's crest), appears on this Great Seal as a cross moline—a different thing altogether. A cross moline would be the more correct symbol for Queensland and its cane-crushing mills, for the name of the cross means something relating to a mill, and its shape is that of the old iron clamp used on a millstone. The Queensland authorities are unable to give any reason for the Maltese cross on their State crest and badge. The badge of Western Australia on the Great Seal is also different from that shown in the verbal blazon of the Commonwealth arms, which is 'Or a swan naiant to the sinister sable;' on the seal it swims to the right. The inscription round the seal is:—GEORGIUS V D:G: BRITT. ET TERRARUM TRANSMAR: QUAE IN DIT: SUNT BRIT: REX F:D: IND: IMP: COMMONWEALTH OF AUSTRALIA.

Arms.—A short explanation of the technical terms and methods employed in describing armorial bearings, etc.—an art usually known as Heraldry—must precede discussion of Australian heraldry in general. These bearings were conceived and originally represented in colour. When they are reproduced in black-and-white, certain conventional 'tincture-lines' are used.



TINCTURES AND METALS

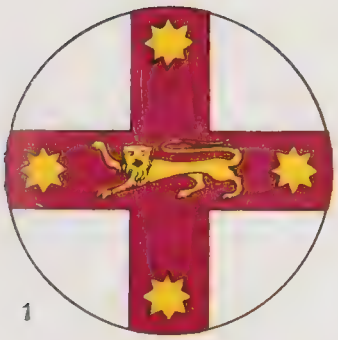
Of the 'tinctures' two are metals (or and argent), five colours (gules, azure, sable, vert, and purpure), and one a fur (ermine). Vair and potent, not shown here, are likewise reckoned as furs, because they originally represented the skin of a squirrel. The background of any shield is called the 'field,' whatever is depicted on the field is the 'charge,' and all objects depicted in their natural colours are said to be 'proper'—thus a crown proper means one depicted in gold (or). A St. Andrew's cross is a 'saltire.' A broad band running from top to bottom of a shield is a 'pale,' and devices placed on it are said to be 'borne palewise;' similarly a shield divided by a line from top to bottom is said to be divided 'per pale,' whereas one divided across the middle horizontally is divided 'per fesse.' A 'chevron' is a band bent at an angle, like two rafters meeting in the gable of a house. 'Right' and 'left,' or 'dexter' and 'sinister,' are used as if the writer were behind the shield, holding it; so that the side of the shield which is on the left hand when viewed in an illustration is in heraldic nomenclature called 'dexter.' As it is a rule of heraldry that metal should not be placed directly on metal or colour on colour, very thin borders of metal, called fimbriations, are introduced between two colours, and of colour between two metals. With these explanations the descriptions now to be given of the seals, badges, and coats of arms used by Australian States and cities should become intelligible to all. Other technical expressions occurring in the descriptions can be understood by reference to the coloured figures they describe.

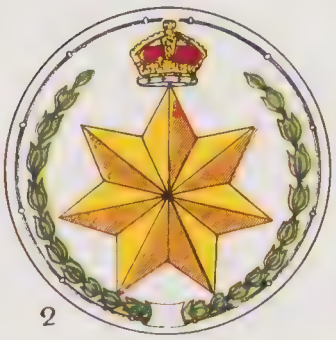
Plate xliii, fig. 9 shows the arms of Captain Cook. After his death in 1779, these were granted to his widow by George III; the original grant from the Heralds' College is now in the Australian Museum. On a blue shield, between two six-pointed gold stars, is depicted a globe proper, showing its eastern hemisphere, on which in red are lines representing the tracks of Captain Cook's ships; on a wreath silver and blue, an arm in a naval uniform holding a Union Jack of the period, proper; below this, on a scroll, 'Circa orbem' (round the world). Below the shield, on a scroll, are the words (containing an obvious slip for *intentatum*) 'Nil intentatem reliquit' (he left nothing untried). Round the base in the original grant are trophies of flags, cannon, shot, etc., but these are not part of the grant of arms. In remembrance of Captain Cook's services in exploring the east coast of Australia, the two six-pointed stars and the globe in his arms appear again on the pale in the arms of the city of Sydney.

Arms of the Commonwealth and States.—Plate xxv, fig. 1 represents the coat of arms granted to the Commonwealth by King George V on 19 September 1912, in place of the arms granted by King Edward VII on 7 May 1908. The figure is adapted from an official coloured reproduction, which, however, has at its base and round the lower part of the supporters and shield an enormous mass of conventional wattle, with the word 'Australia.' As these accessories are not referred to in the 'official blazon' from the Heralds' College, London, they have been omitted. The arms consist of a shield bordered with ermine, containing six divisions pale-wise the badges of the six States. On a wreath of gold and blue there is for crest a seven-pointed gold star, and for supporters a kangaroo and an emu, both proper. The use of badges as arms is heraldically incorrect. Although officially extinct, the coat of arms of 1908 is still impressed upon the Commonwealth coinage.

Plate xxv, fig. 4 shows the arms in use by the State of New South Wales, granted by King Edward VII on 11 October 1906, and received in Sydney in February 1907. They are:—azure, a cross argent voided gules, charged in the centre chief point with a lion passant guardant, and on each member with a mullet of eight points, or; between in the first and fourth quarters a fleece of the last banded of the second, and in the second and third quarters a garb, also or; for the crest, on a wreath of the colours, a rising sun, each ray tagged with a flame of fire proper; for supporters, on the dexter side a lion rampant guardant, and on the sinister side a kangaroo, both or, together with this motto, 'Orta Recens Quam Pura Nites' (newly arisen, how bright thou shinest).

The arms of the State of Victoria (plate xxv, fig. 5) were granted by King George V on 6 June 1910. They consist of:—azure, five stars argent, representing the constellation of the Southern Cross. Two stars have seven, one has


1

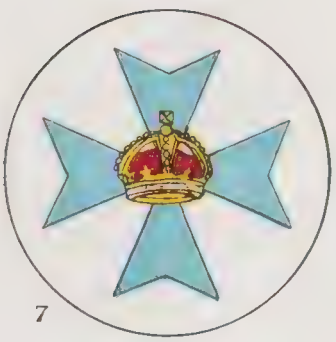

2

3

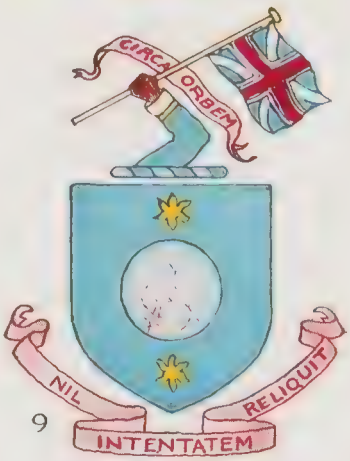
4

5

6


7

8



9

10

11

Drawn by C. R. Wylie.

1. New South Wales.
2. The Governor-general.
3. Victoria.
4. South Australia.
5. Papua.
6. Western Australia.
7. Queensland.
8. Tasmania.
9. Arms of Captain Cook.
10. Banner of the City of Sydney.
11. Badge of the City of Sydney.

six, one five, and one eight points. The crest is, on a wreath argent and azure, a demi-kangaroo proper holding in the paws an imperial crown, or. The supporters are, on the dexter side a female figure representing Peace, proper, vested argent, cloaked azure, wreathed round the temples with a chaplet and holding in the exterior hand a branch of olive, also proper—and on the sinister side a like figure (representing Prosperity) vested argent, cloaked gules, wreathed round the temples with a chaplet of corn and supporting with the exterior hand a cornucopia proper, together with the motto 'Peace and Prosperity.'

The arms of the State of Queensland (plate xxv, fig. 2) were granted by Queen Victoria on 29 April 1893. They are:—per fesse the chief or, the base per pale sable and gules; in chief dexter a bull's head in profile, muzzled, and a ram's head, respecting each other, proper; the dexter base charged with a garb of the first, and on the sinister base on a mount vert, a pile of quartz, issuant therefrom a gold pyramid, in front of the mount a spade surmounted by a pick saltire-wise, all proper; and for the crest, on a wreath of the colours a mount vert, thereon a Maltese cross azure, surmounted with the Imperial crown between two sugar-canes proper; below, on a scroll, the motto 'Audax at Fidelis' (bold but faithful).

South Australia possesses no armorial ensigns, but uses for official and other purposes the circular State badge (plate xliii, fig. 4). This is:—the rising sun or, with thereon an Australian piping shrike displayed proper, and standing on a staff of gum-tree raguly gules and vert. This badge is also used in black-and-white. It was adopted in January 1904. The piping crow-shrikes (genus *Gymnorhina*) are familiar Australian birds, commonly known as magpies.

To Western Australia no grant of arms has been made, the circular State badge (plate xliii, fig. 6) being used. This is:—or, a swan naiant to the sinister, sable. This is used also in black-and-white, as the State seal, on note-paper, etc., for official purposes.

The arms of Tasmania (plate xxv, fig. 3) were granted to the State by King George V on 21 May 1917. They are:—quarterly gules and barry-wavy argent and azure; a fesse of the second charged with a ram statant, proper, between in chief a garb and a thunderbolt, and in base four apples and a branch of hops, all or; for the crest, on a wreath argent and gules, a lion statant gules resting the dexter fore-paw on a spade and a pickaxe in saltire proper; and for supporters on either side a Tasmanian tiger proper, with the motto 'Ubertas et Fidelitas' (richness and faithfulness).

Badges of States, etc.—These are used where a coat of arms would not be convenient, or, as by the States of South and Western Australia, in place of armorial ensigns.

The badge of New South Wales (plate xliii, fig. 1) is:—a red St. George's cross in a white circle; in the centre of the cross a lion passant guardant, gold, and at the end of each limb of the cross an eight-pointed gold star. This badge is part of the arms of the State.

The badge of Victoria (plate xliii, fig. 3) is:—on the upper part of a blue circular field an imperial crown proper; below this the Southern Cross consisting of two stars of seven points each, one of six, one of five, and one of eight. This is the State coat of arms plus the imperial crown.

The badge of Queensland (plate xliii, fig. 7) is:—a white circle containing a blue Maltese cross, bearing in its centre an imperial crown proper. This badge is part of the State crest. No reason can be found for the use of the blue Maltese cross.

The badges of South and Western Australia have been described already.

The badge of Tasmania (plate xliii, fig. 8) is:—in a white circle a red lion passant. It is part of the State crest.

The badge of Papua (plate xliii, fig. 5) is:—on a white circular field an imperial crown proper, below this in black block letters 'Papua.'

The badge of the governor-general of the Commonwealth (plate xliii, fig. 2) is:—a wreath of laurel leaves in a white field; inside this a seven-pointed gold star; above it an imperial crown proper.

Arms and Badges of the Principal Cities.—Sydney possesses what is probably the most complete heraldic 'outfit,' if one may use the term, of any city in the British Empire. The arms (plate xxv, fig. 6) were granted by King Edward VII on 30 July 1908. They are:—per fesse or and azure, a three-masted ship in full sail argent; on a chief, between the arms of Townshend (azure, a chevron ermine between three escallops argent and a crescent or, for difference) and the arms of Hughes (gules, a chevron between three lions rampant, or; on a chief arched, argent, two roses of the field, a crescent or, for difference), a pale argent, charged with a cross gules, thereon a globe proper between two estoiles of the first, in pale. And for the crest, on a wreath of the colours, an anchor erect, ensigned by a mullet of six points gules, and enfiled by a civic crown or. Then comes a special grant of supporters: on the dexter side an aboriginal of Australia holding in the exterior hand a native spear, and on the sinister, a sailor of the 18th century, armed with a cutlass and a brace of pistols in his belt, holding in the exterior hand a boat-hook, all proper. An esquire's helmet and a lambrequin or mantling of or and azure are upon the shield, and below, on a label, the motto 'I take but I surrender.' This refers to the original taking possession of the country by the British government, and the handing it back again to the self-governing community. The ship, with its field of or and azure, symbolizes a prosperous shipping port. The arms of Townshend are in honour of Viscount Sydney, principal British secretary of state in 1788, after whom the city was named by Captain Phillip. The arms of Hughes refer to Thomas Hughes, first lord mayor of Sydney, during whose second term of office in 1903 the increased status was granted to the city, and during whose further terms in 1907 and 1908 the armorial honours were granted. The crest of an anchor encircled by a civic crown typifies maritime power and civic unity.

The badge of the city of Sydney (plate xliii, fig. 11) was granted by King Edward VII on 2 November 1909, at the city's request, to be used on liveries, furniture, note-paper, and so forth, instead of the city crest. There is no special grant of a banner to the city, but fig. 10 is an exact copy of the banner drawn and painted by the Heralds' College on the official grant of arms, and is built up of the arms, crest, badge, and motto.

The city of Melbourne appears to have no official grant of arms, but has adopted for civic use a design similar to that on the municipal seal. This is:—argent, a cross gules, charged

in the centre chief point with an imperial crown or; in the first quarter a fleece proper, suspended by a ribbon or, in the second a whale naiant spouting proper, in the third an ox in a meadow

Arms of the city of Melbourne.

proper, in the fourth a three-masted ship proper; for the crest, on a wreath of the colours, a demi-kangaroo proper; the whole is surrounded by two sprays of wattle-blossom proper; the motto, below on a ribbon, 'Vires Acquirit Eundo' (she gathers strength as she goes).

The city of Brisbane for the last 50 years has used the following devices in a shield, also on the civic seal, uncoloured:—in the first quarter a horse standing, an ox and two sheep lying down; in the second, a settler standing with a

Arms of the city of Brisbane.

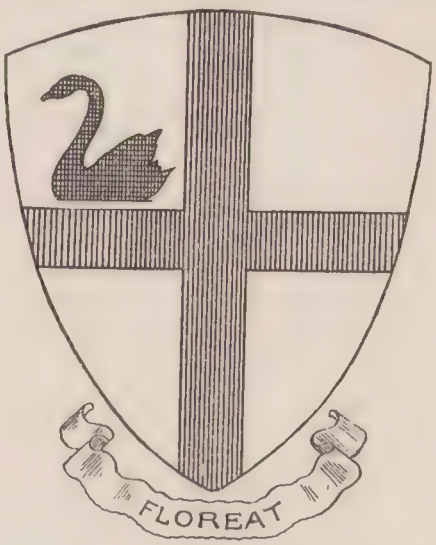
spade in his left hand, behind him a plough, and in front on the right, a sheaf of wheat; in the third, a paddle-wheel steamer approaching the land, behind on the right a lighthouse; and in the fourth, part of a sailing-ship at a wharf, on which are barrels, boxes, and bales marked 'wool,' in the foreground an anchor. The motto, added in 1903 when a local authority was amalgamated with the city, is 'Conjunctis Viribus' (with united strength).

The city of Adelaide has used since May 1859 a design similar to that of the municipal seal—for which, in fact, the design was originally made. This is:—azure, a cross or, voided gules between; in the first and second quarters a ship

Arms of the city of Adelaide.

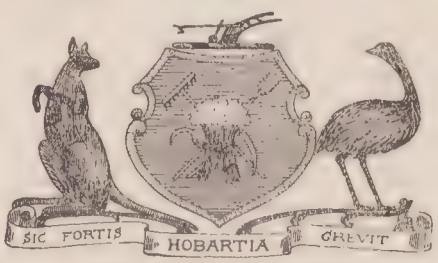
in full sail and a fleece, and in the third and fourth a bull's head, caboshed, and a garb; for the crest, on a wreath of the colours, a mailed arm grasping a miner's pick; for supporters, dexter a lion rampant guardant, and sinister a kangaroo rampant regardant, all proper; motto, 'Ut Prosint Omnibus Conjuncti' (that by unity they may profit all).

The city of Perth possesses no grant of arms; a reproduction of the city seal is used in place



Arms of the city of Perth.

thereof. This is:—argent, a cross gules; in the first quarter a swan naiant to the dexter, sable. Beneath, on a scroll, the motto 'Floreat' (may she flourish).



Arms of the city of Hobart.

The city of Hobart has adopted for civic use the following:—on a shield azure, bordered or,

a sheaf of wheat; arranged round this a hay-rake, a pitchfork, a sickle, and a scythe; for the crest, on a wreath of the colours, an old-fashioned plough; for supporters, dexter a kangaroo, and sinister an emu, regardant; motto, 'Sic Fortis Hobartia Crevit' (so grew Hobart in strength). C.R.Wy.

Sea Pike, vernacular name of the genus *Sphyraena*, whose powerful dentition and superficial resemblance to the voracious pike of the northern hemisphere have earned them the name. There are several species of *Sphyraena* in Australian waters, mostly of small size; but some foreign allies (including the famous barracuda of the West Indies) attain a length of over six feet, and are so voracious as to be dangerous to man. A.R.McC.

Sea-serpents. At least three sea-serpents of varying shapes and dimensions have been recorded from Australian waters. On 8 June 1890 James Alsbury and William Lees, lighthouse-keepers at Sandy Cape in Queensland, saw in shallow water near the island an animal with a turtle-like body (the carapace was 'quite five feet high'), a long neck, a head with the mouth full of teeth, and a scaly tail at least 12 feet long carrying chocolate-brown semi-transparent flukes and a thick fleshy fin about 3 feet in from them. Its colour was silver-gray shading to white. Five other witnesses signed the report which gives this description. A full account of the event with illustrations is given in Savile-Kent's *Great Barrier Reef of Australia* (1893), pp. 323-6. In 1901 a sea-serpent of the more usual type—a long snake-like creature swimming in open sea—was viewed off Cape Naturaliste in Western Australia by the masters of the *Nemesis* and the *Perth*, 12 hours intervening between the two appearances. And on 2 February 1925 a creature about 60 feet long and 2 feet thick, dark yellow in colour, was seen asleep on the surface of the sea about a mile off the Port Stephens lighthouse in New South Wales; it had a turtle's head and a fin like a shark's along the middle of its back. This record was made in the official log of the steamer *St. Francois Xavier* on a voyage from Noumea to Newcastle in New South Wales.

Less well authenticated records relate to appearances of two sea-serpents in 1889 off Suva in Fiji, and of one 53 feet long and 12 feet in girth cast up on a reef in the Paumotu group at some indefinite but earlier date. See RIBBON-FISHES.

Sea-swallow. See GULLS, TERNS, AND SKUAS.

Sea-urchins. See ECHINODERMATA.

Selaginella. See LYCOPODIALES.

Selenite. See MINERALOGY.

Selliera, a genus of the family Goodeniaceae, consisting of 2 species of creeping perennial herbs, one endemic in Australia, the other extending to New Zealand and extra-tropical South America. The calyx is 5-lobed; corolla of 5 petals, the margins inflexed or winged; stamens free; fruit more or less succulent. *S. radicans* occurs in either salt-marshes or tidal streams, but cannot exist on dry sand-dunes. Its thick, succulent leaves act as reservoirs of fresh water, as it cannot absorb large quantities of salt water. The flowers are neutral-tinted, and lie horizontally on the branches.

Selwyn, GEORGE AUGUSTUS (1809-1878), born on 5 April 1809 and educated at Eton and St. John's College, Cambridge (B.A., 1831; M.A., 1834; D.D., 1841), after graduating settled at Eton as tutor to the sons of Lord Powis. In 1833 he was ordained deacon (priest, 1834), and acted as curate at Boveney and at Windsor, where he was practically in sole charge; there he displayed such organizing talent that Bishop Blomfield in May 1841 offered him the bishopric of New Zealand. So careless or ignorant was the colonial office of that day that Selwyn's letters patent—by which the crown gave him official status in the new colony—assigned him a diocese stretching from 50° S. lat. to 34° N. lat., or 1400 miles north of the Marshall Islands. He was consecrated on 17 October 1841 at Lambeth, and sailed on 26 December in the *Tomatin*, accompanied by a party of clergy and catechists. Reaching Sydney on 14 April 1842, he arrived at Auckland in the *Bristolian* on 30 May. During the voyage he learnt the Maori language from a Maori fellow-passenger, and acquired a knowledge of seamanship which helped him greatly when he visited the Pacific islands. He established provisional headquarters at Waimate North on the Bay of Islands, and founded there St. John's College, to serve at once as a technical school, a seminary for theological students, a hostel for young immigrants, and a 'refuge for the sick, the aged, and the poor.' Farming, forestry, horticulture, carpentering, printing, and weaving were the first trades taught. In 1845 the college was removed to the neighbourhood of Auckland.

In six years Selwyn completed a pastoral visitation of New Zealand, and convened a synod at Wellington (1844) which was declared illegal, and a second (1847) for which he obtained authority from the archbishop of Canterbury. In 1847, too, he began a series of voyages to the Pacific islands which resulted in the establishment of his most important enterprise, the Melanesian mission; how far this extension of his religious activities was encouraged by the very wide bounds which the colonial office had assigned to his diocese is a matter of opinion, but the coincidence is interesting. In 1850 he attended the first Australian episcopal conference and was instrumental in establishing an Australasian board of missions. In 1854 he visited England to obtain (*a*) power to subdivide his diocese and (*b*) permission for the New Zealand Church to manage its own affairs by a general synod. He also procured the appointment in 1861 of John Coleridge Patteson (q.v.) as bishop of Melanesia. In 1859 the first general synod of New Zealand settled under Selwyn's direction the legal constitution of the New Zealand Church; this constitution has reacted in many ways on the Church in England and Australia. In 1867 he attended the first pan-Anglican synod in London, and while there accepted the see of Lichfield, being enthroned bishop on 9 January 1868, and administering the see till his death on 11 April 1878.

Selwyn's written works are for the most part pamphlets and sermons of no outstanding interest, but his *Letters and Journals*, published in London at intervals between 1847 and 1851, are the best authority for his early years in New Zealand. Selwyn College at Cambridge, England, is a memorial to him, and was for some time presided over by his second son, John Richardson Selwyn, who was also bishop of Melanesia in 1877-90. J.V.C.-B.

Semecarpus, a genus of the family Anacardiaceae, found in tropical Asia but most abundant in Ceylon. The only species indigenous to Australia is *S. anacardium*, the Marking Nut Tree of India, an ornamental tree with small, clustered flowers. The fruit is a kidney-shaped drupe, seated on the enlarged, top-shaped base of the calyx. This fleshy receptacle is yellow and edible; so are the seeds, which in India are salted when green and used like olives; when fresh, they are somewhat astringent. In India, the oil obtained from the nuts is used for making paint; the juice, mixed with quicklime, provides an indelible ink, and is also made into a black varnish for caulking ships.

Senecio, the largest genus of the family Compositae, consisting of herbs (rarely shrubs), most with showy yellow flowers, and ranging over nearly the whole world. The floral bracts are usually narrow, in a single row, often reflexed after flowering; flower-heads with or without ray flowers; fruits angular, with a pappus of numerous bristles. *S. lautus* has exceptionally variable leaves, which range from thin and entire to succulent and deeply-divided, according to the habitat of the particular plant. *S. vulgaris* is the common English groundsel. When crushed, many species emit an odour unpleasant to some people.

Sepia. See MOLLUSCA.

Septic Tank, THE, derives its interest from its intimate connection with the more general subject of Health. In quite recent times there is a growing recognition that 'health' means something more than, and even different from, the mere absence of diseases. Careful thinkers are beginning to use the term 'healthy' in the fuller sense of *mens sana in corpore sano* —'a healthy mind in a healthy body.' In natural conditions of living a spontaneous feeling of both bodily and mental well-being should be a concomitant of all our bodily and mental functioning. But in the most elementary matters of existence—for example, eating and drinking—man lies under disadvantages. The physiology of the human body has not adapted itself completely to the anatomically erect attitude, human reason has not corrected the errors of desire, and man suffers in consequence. He is ruled by multifarious considerations in respect to diet; he does not eat when he is hungry and drink when he is thirsty; appetite is not his guide as to when, what, and how he shall eat, drink, and exercise other bodily functions; among civilized communities feeding has been elevated to a social function with consequences that make for good or evil; much of man's food is not brought to him in its natural state, but is treated in a variety of ways for storage or transport or other purposes. This state of affairs contributes to a low standard of general health. It is now being urged, on evidence which demands consideration, that the incidence of certain diseases, such as cancer and appendicitis, is associated with, if not actually caused by, abnormal conditions of food, feeding, and excretion. These conditions are largely dependent on health-giving surroundings, on housing and the problems connected with domestic sanitation, especially ventilation, water-supply, and disposal of waste products. If in any country mansion, rural cottage, or isolated suburban house one could have all the appliances and comforts of bathrooms, lavatories, and suchlike conveniences that are available in city houses, and without the risks of offensiveness from neighbours' drains or other sanitary neglect, then country residence would rise in general estimation. That such a mode of living is possible has been proved by the use of the septic or bacteriolytic tank system.

At different times and in different places various methods of dealing with nightsoil and allied products have been in vogue—such as burying in the earth, burning, treating with chemicals, water-carriage to the sea, rivers, sewage-farms, and suchlike. It came to be recognized that the natural decomposition of manure was due not to chemical but to biological processes, and about the beginning of the present century there was in Great Britain and elsewhere a good deal of inquiry into the utilization of the organisms contained in sewage as a means of accelerating the natural decomposition. Experiments were carried on by means of 'septic tanks,' in which use was made of contrivances to expedite decomposition by various bacteria working under different conditions. It is to be feared, however, that the literature on the subject of septic tanks and bacteriolytic treatment would give even an intelligent and expert inquirer but little help in deciding upon an installation that would meet his particular requirements. Scientific method consists in observing the 'what' of actual happenings and then investigating the 'how' of their occurrence. After this there follows the establishment of such conditions as will allow the 'happening' to occur with the simplest appliances, in the shortest time, and in the most natural and inexpensive manner.

In the year 1902 there was occasion to deal with the system of sanitation at a fairly large railway station in South Australia. Some experiments had been made in the treatment of sewage by private persons and others interested, and the results were utilized in recommending a method of sewage disposal by septic tank systems. An experience in that State of about eleven thousand such installations has provided sufficient facts from which to draw trustworthy conclusions as to the nature, use, and value of sundry types of septic tanks, and an outline may be given of their place in the sanitary administration of the State.

An idea of the essential features of a tank intended for a household of eight persons may be gathered from fig. 1 and 2—one an oblong, the other a cylindrical, form. The tank may be covered or open; in almost all installations it is covered. Oblong tanks are usually made of brick, lined with concrete; cylindrical 'one-piece' tanks, made of reinforced concrete, are now largely used; they may be conveniently 'transplanted' for use elsewhere. Fig. 3 shows a 'block plan.'

Closets. No modification of the ordinary water-closet is necessary in respect to structure, fittings, or position. The structure and arrangement of the cistern, closet pan, soil-pipe, trap, and ventilator differ in no way from those required in an ordinary system of sewerage or deep drainage. The 'flush' should not amount to more than two gallons; it may be less, so long as it is effective for closet purposes.

The disposal of bath water and hot water will depend on circumstances. A relatively large amount of hot water, or of soapy or greasy water, will impair the action of the tank, and it is not advisable to connect the bath and sinks with the tank unless precautions have been taken to remove soap and fat, and to cool hot water

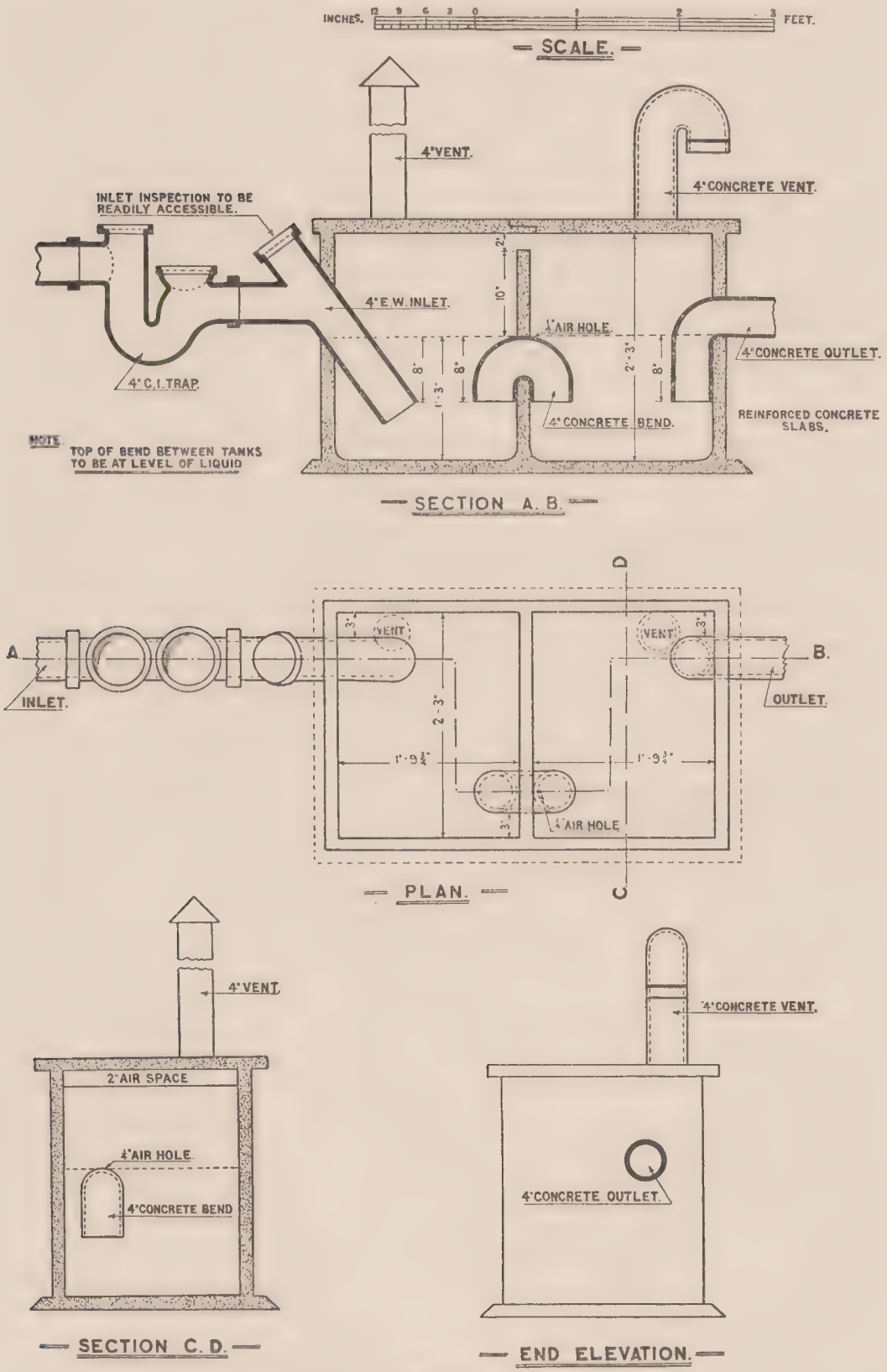


FIG. 1. Oblong Septic Tank.

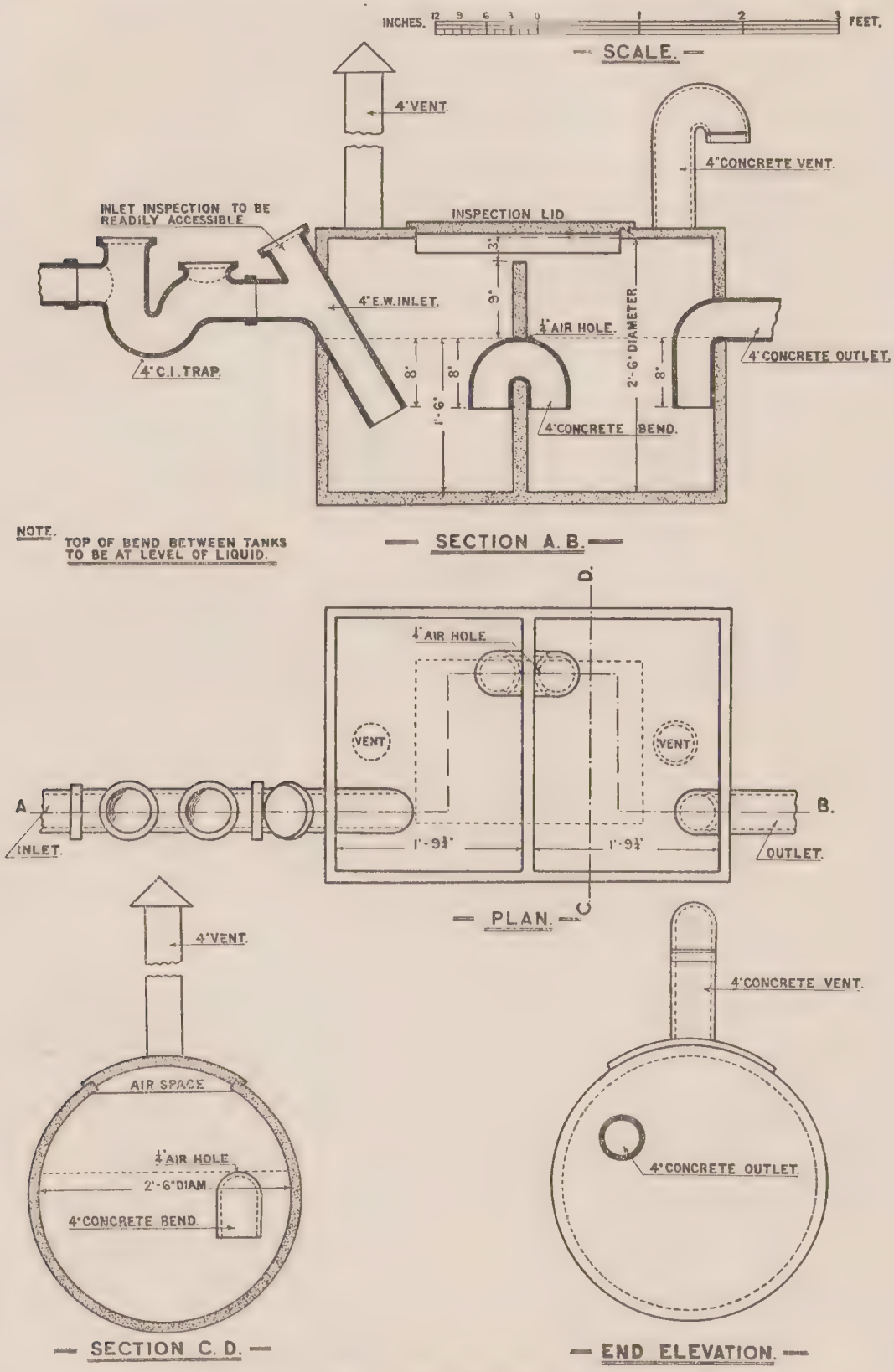


Fig. 2. Cylindrical Septic Tank.

or regulate its flow. The position of the tank may be any that is convenient; usually it is underground, but it may be aboveground if so required for the outlet 'fall.' Distance from the house or closet is a matter of no moment. Trapping the drain, as shown in the plan, is usually not made compulsory unless the distance between closet and tank is 20-feet or more. The two compartments of the tank are generally made equal in size; but experience has shown that either may be the larger, so long as there is no great difference.

Inlet. Nothing connected with the structure or working of a tank should tend to break the scum that forms on the surface of the liquid in the first compartment; hence there should be no 'rush of sewage.' The inlet should be below the surface of the scum; the form of inlet pipe shown in the figures, which has been in common use since 1908, gives satisfactory results. The top of the partition between the two compartments should be about 12-in. above the 'outflow level' and about two inches below the roof of the tank. This is necessary because, for seasonal or other reasons, the scum may sometimes attain a thickness of a foot or a good deal more, and a large proportion of this may be above the level of the liquid in the first compartment. For the passage of the liquid from the first to the second compartment several contrivances, differing in shape and position, have been used, such as one or more bends or half-bends, or one or more simple openings in the partition. The one which has been found most effective is a 'siphon-bend' such as that represented. One precaution is necessary. In some cases it was found that this bend failed to give passage to the liquid on account of 'air-block' at its upper level. This danger is obviated by providing a hole, about a quarter of an inch in diameter, on the shoulder of the portion of the bend in the second compartment. The inlet pipe, the bend between the compartments, and the outlet pipe are so arranged as to give the maximum amount of movement in the flow, i.e., they are placed on alternate sides of the tank.

The outlet from the second compartment should be by means of a bend as shown. Since the effluent of a properly working tank is inoffensive and innocuous, it may be disposed of as circumstances permit. Usually it may be conveyed in a close-jointed pipe for two or three yards, then in one which is open-jointed and perforated surrounded by rubble or clinker; or it may be used for irrigation of a space planted with vegetation. If this is not practicable, it may be conducted to a 'soakage well.' A catch-pit with a porous bottom or sides is neither legally nor scientifically a cesspool, if it receives only the effluent of an effective bacteriolytic tank.

Ventilators. Two independent ventilators are essential for securing a proper current of air, and both may be placed on the second compartment, or one on each compartment, provided that there is an open space at the top of the partition. It must be remembered that the function of the ventilators is to provide a supply of air for the second compartment, not to allow of the escape of foul gases or bad odours, which should not exist. One ventilator

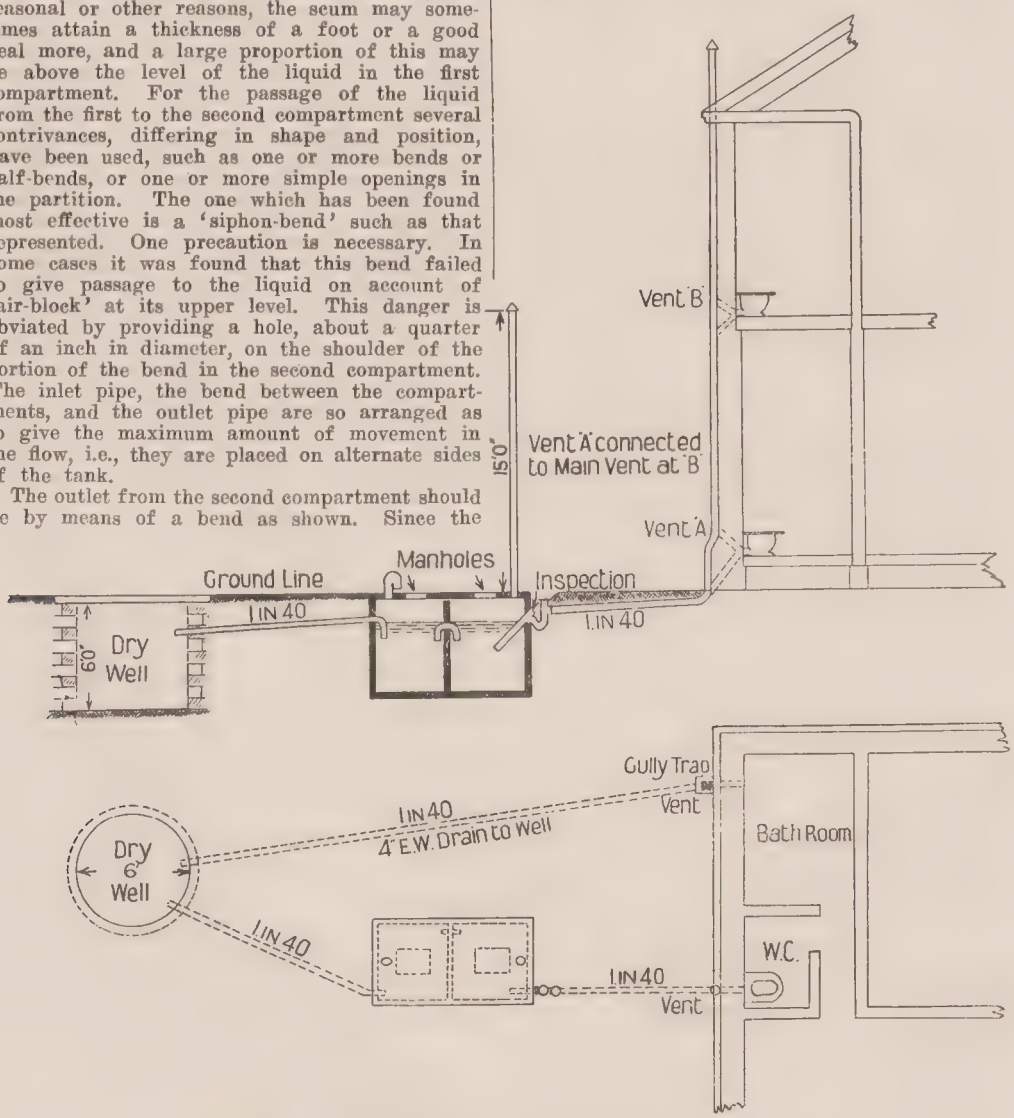


FIG. 3. Block Plan of Septic Tank System.

may be a sort of 'inset' in the form of a small chamber of, say, a 'foot cube' in extent, built out from the side of one of the compartments, its top being level with the top of the tank and covered by a grating. Or it may be an ordinary ventilating tube, or a goose neck, about a foot or two in height. In order to ensure a current the other ventilator should be higher, usually from 12 to 15 feet. The vent pipes should be about four inches in diameter, and their openings should be made mosquito-proof by a covering of gauze. In the case of a small tank the manhole may be placed over the centre of the tank, thus opening over the adjacent ends of both compartments. In large tanks it is preferable to have a manhole over each compartment.

In practice there seems to be a preference for closed rather than open tanks. This choice has not been based on experiment or observation, but appears to be a matter of sentiment. Liquefaction and purification are effected to a certain point in the first chamber by bacteria acting in the dark and without the access of air. The action is continued in the second chamber by other bacteria acting in fluid in which oxygen is present, but there seems to be no sharp distinction between the processes in the two chambers.

When an installation has been completed, the tank is filled up with water till it overflows at the outlet; it is then ready for use. A period of several weeks is usually necessary for the formation of a satisfactory scum in the first compartment; but the time may be reduced by inoculating the liquid with materials taken from the under-surface of the scum of another tank.

It will be seen that, in the type of installation which is now almost invariably adopted, many things are omitted that in the early days were considered advisable or even essential. There is no filtration at any stage; there are no baffle-plates or other devices for promoting distribution of the contents; no use is made of clinker or other such means of providing greater surface for bacterial action in the first chamber.

The object of sewage treatment in a tank is to provide a system of treatment which will give all the advantages of a water-closet and sewerage system, without offensiveness and without entailing cost for up-keep—the initial outlay for materials and labour being the only expense necessary. In the case of an ordinary household this usually amounts to not more than £25, exclusive of the cost of the walls of the closet.

The total number of installations in South Australia since 1908 is 10,786; before that date there are no complete records, but the number was comparatively small. In that year the Central Board of Health found it necessary to undertake their supervision and control, and to make regulations requiring all plans to be submitted for approval. A tank and its connections, when completed, are examined by an inspector, and, if the work is satisfactory, a permit is issued and a duplicate of the plans filed in the department. This applies to installations in every part of the State. No charge is made by the department for its work. The Central Board has on no occasion ordered the installation of a tank, but the Licensing Board makes it one of the conditions of granting or renewing a hotel licence in places where a supply of water is available. 'Intermittent' tanks of the typical pattern have been employed for many years at recreation grounds, camping grounds, racecourses, church halls, public halls, seaside resorts, and sports grounds; these require no special attention. Under a recent act of parliament municipal councils in South Australia have power to insist on installations at all buildings within their bounds. W.R.S.

Serra, Dom Joseph Maria Benedict, born in Spain, at an early age entered the Benedictine monastery of St. Martin at Compostella. On the suppression of the religious houses in Spain in 1835 he proceeded in company with Dom Salvado (q.v.) to the monastery of La Cava in Italy. He was the Superior of the Benedictine missionaries brought by Bishop Brady (q.v.) to Western Australia in 1846 for the purpose of evangelizing the aborigines, and established at New Norcia. In 1847 he was made first bishop of Victoria (Port Essington), but in 1849 was transferred to Perth as coadjutor to Bishop Brady and as Bishop of Daulia *in partibus*. In 1852 Bishop Brady retired to Ireland and Bishop Serra became administrator of the diocese. He left the colony in 1859; in 1861 he resigned the coadjutorship and, by permission of the Holy See, withdrew to Spain, where he died on 8 September 1886. See Benedictine Order. E.M.O'B.

Service, James (1823-1899), born at Kilwinning in Ayrshire in November 1823 and trained to mercantile pursuits, in 1853 migrated to Melbourne to take advantage of the business prosperity due to the gold-discoveries. In 1857 he was elected by Melbourne to the legislative assembly, where he sat in opposition to the O'Shanassy ministry; in 1859 he joined the Nicholson ministry as commissioner for lands and introduced a bill abolishing the sale of country lands by auction—instead, small blocks were to be thrown open to selection at a uniform price and on conditions ensuring residence and improvement. This bill was mutilated beyond recognition by squatters' representatives in the council, and Service angrily resigned office, but as a private member carried through a 'Torrens title' act to facilitate the transfer of property. In 1862 he resigned his seat to visit England; in 1865 he returned and threw himself into the fiscal controversy roused by McCulloch's protectionist tariff, but his freetrade views had become unpopular, and he was defeated in three successive elections. In 1874, however, he was returned for Maldon, became treasurer in the Kerferd ministry, and attempted to lower the tariff, counterbalancing the loss of customs revenue by a land and house tax and increased duties on spirits and tobacco. But his budget was unpopular, and the ministry resigned. He was in opposition during the Berry and McCulloch ministries and was largely responsible for McCulloch's defeat in 1877. When Berry returned to power, Service declined cabinet rank, but gave Berry independent support until the political debacle of Black Wednesday (q.v.). There followed a bitter constitutional struggle, and when in March 1880 Service became premier he brought down a reform bill to democratize the council, increase its financial powers, and convert its absolute veto over legislation into a suspensive one. The bill was defeated, Service unsuccessfully appealed to the country, and soon afterwards resigned his seat and revisited England. In 1883 he won the Castlemaine seat as leader of a constitutional party, and induced Berry

to join his ministry. This coalition government established the public finances on a sound basis, ended patronage in the civil service by a public service act and a railway management act, brought into occupation several million acres of mallee land in the north-west, and appointed a commission to investigate water-conservation and irrigation. Service himself devoted much of his time to problems of defence and foreign policy, and by the discipline act of 1883 replaced the volunteer corps with a paid militia and set up a ministry and council of defence. He supported Queensland's demand for the annexation of New Guinea (see PAPUA), strongly opposed French *récidiviste* policy in the Pacific, and took a leading part in calling together the colonial conference of 1883 which agreed to the creation of a federal council. He represented Victoria at the first council (1886), but then resigned office, again visited England, and in 1887 represented Victoria at the Imperial conference. In 1888 he returned to Melbourne and was elected to represent the Melbourne province in the legislative council. He took only a minor part in debate, but maintained his interest in federation, and at a banquet held in connection with the conference of 1890 conjured up a fiscal 'lion in the path.' Thenceforward he lived in retirement, and died on 12 April 1899.

Sesbania, a genus of the family Leguminosae, consisting of herbs and shrubs, and more rarely small trees, widespread over tropical regions. The leaves have numerous leaflets; flowers in short spikes, red, white, yellow or variegated; pod long and narrow, the seeds separated by spurious transverse partitions. *S. aculeata,* a tall, erect herb with yellow flowers often beset with conical prickles, is in India known as 'danchi' and cultivated for its fibre; this, though coarse, is very durable in water or so long as it is repeatedly wetted, and is therefore suitable for the ropes of fishing-nets. It has been stated that in northern Queensland the aborigines call this plant nardoo; but that word belongs to the dialects of the Lake Eyre district, and the true nardoo (q.v.) is a *Marsilea. Sesbania* (*S. aculeata* in particular) yields seeds that are ground by the aborigines between stones for food. *S. aegyptiaca,* a yellow-flowered evergreen shrub known along the Cloncurry River as 'ngeen-gerry,' extends also to India. Its leaves and branches are used for fodder, and the wood makes excellent gunpowder charcoal.

Settlers' Twine. See GYMNOSTACHYS.

Seven-gilled Sharks (also called 'one-finned sharks'), a small and widely distributed group (Hexanchidae) presenting several primitive characters by reason of which they are given priority among sharks in most classifications. They have only one instead of the usual two dorsal fins, and six or seven instead of five gill-openings. Their teeth are remarkably complex, and those of the upper jaw differ altogether from those in the lower. A species (*Heptranchias perlo*) commonly taken in moderate depths off the south-eastern coast of Australia is not distinct from one that occurs in European waters; it is gray in colour, with a striking green eye, and its snout is pointed. Another (*Notorhynchus pectorosus*), occasionally captured in shallower waters, is light gray in colour with small dark spots, and is distinguished from *H. perlo* by its broadly rounded snout. Both species are of small size, and quite harmless to man. A.R.McC.

Seventh-day Adventists. Seventh-day Adventism arose in America in 1844 from the successful efforts of Mrs. Rachel Preston, a Seventh-day Baptist, to induce an Adventist Church in Washington, New Hampshire, to observe the Sabbath on the seventh day of the week. From this small combination of Seventh-day Baptists and Adventists the denomination gradually grew into an organization with churches in many parts of America, and in course of time began to look abroad for other fields of labour. A party of ministers—S. N. Haskell, J. O. Corliss, and M. C. Israel—with their families and assistants, was despatched to Australia, arrived at Sydney on 9 June 1885, and proceeded to Melbourne to commence their work. At first their efforts were chiefly directed to the preparation and distribution of denominational literature, their printer being one of themselves, Henry Scott. The denominational organ, *The Bible Echo and Signs of the Times* (now known as *The Signs of the Times*) was first published (January 1886) as a monthly magazine; later it became a weekly. In the same month the first Seventh-day Adventist Church in Australia was organized in Melbourne with a membership of 29; within six months it had increased to 95. Gradually the work extended to the other Australian capitals, and to various country centres; within 15 years 39 Churches had been organized, with a total membership of 1994. The staff then included 19 ordained ministers, 18 licensed preachers, 20 Bible teachers, and 75 colporteurs; medical and other workers raised to 350 the number of persons actually devoting their time to evangelical or institutional work in Australasia. Five years later (1905) the conference reports show that, besides propaganda work in all parts of Australasia, missions were being conducted in Fiji, Norfolk Island, Pitcairn, Rarotonga, Samoa, Tahiti, Tonga, Singapore, and Sumatra; the membership had grown to over 3000, and the enrolment in Sabbath-schools to 3853. At the close of the next decade (1915) the members numbered 5422, and the Sabbath-school enrolment 7156. At the time of writing (1926) the numbers are 10,030 and 15,908 respectively. The report for 1925 states that the sum raised for home and foreign mission-work was £121,000.

Publishing.—The denomination's most efficient agent, next to the living preacher, is the press; hence the development of publishing houses has been regarded as essential. From its small beginning in Scott's private home, the publishing work has grown to large proportions; within a decade it had developed sufficiently to require the services of 83 employees. Six years later land was purchased at Warburton, Victoria, for a factory where the employees could live amid rural surroundings, and where water-power could be generated cheaply. At first a 40-horse-power supply was sufficient; it has now over 300 horse-power, and the books and magazines it produces are sold and distributed by colporteurs in all parts of Australasia, as well as in South Africa and India. The plant is engaged solely in the production of denominational literature, and uses over 150 tons of paper and strawboard per annum.

Education.—At a conference in 1891 it was decided to establish a denominational school, and a building was rented on St. Kilda-road, Melbourne. The arrival of Ellen G. White and her son (W. C. White), at that juncture gave impetus to the school project. For years Mrs. White had urged the establishment of country

Fleece wool from merinos should not be pressed to weigh more than 300 lb., since too heavy a pressure renders it less attractive on inspection; the other grades make heavier bales, up to, say, 450 lb. for 'locks' and 'bellies.' Crossbred wool is lighter, and pressure cannot get 300 lb. per bale in the fleece.

When the bales come from the press, they are marked according to their particular quality, weighed, branded with the station brand, and numbered consecutively. Transport to railway is by means of bullock-team, horse-team, or motor lorry. In the far western districts of Queensland and New South Wales, and in other inland parts of the continent, camels are often used. Several inland rivers also furnish a cheap and efficient means of conveyance; the Darling in particular carries a large quantity of wool to the Adelaide market from the far west of New South Wales. See SHEEP and WOOL.

C.McD.

Sheep. In Australia the sheep, more especially the merino breed, has proved the principal source of the wealth derived from the great pastoral industry. The natural conditions prevailing throughout the greater portion of the continent and also in Tasmania are ideally adapted for sheep and the production of fine wool.

Merinos.—To John Macarthur (q.v.), who arrived in Sydney in 1790, two years after the settlement was established, the effect of the local conditions upon the covering of the Bengal sheep (which had been brought by the First Fleet) was such as to impress him with the possibilities of the colony for wool-growing. These sheep, unattractive in build and appearance, produced a covering which resembled hair, whereas that of their progeny appeared to be of a distinctly finer nature, more akin to wool. From these observations Macarthur gathered that, with pure merino sheep, wool of considerable value might be grown. In 1796 some Spanish merinos were obtained from the Cape of Good Hope; eight of these were eventually procured by him, and with these, and subsequent importations from the flocks of King George III, he laid the foundation of the present-day Australian merino. The improved quality of this now famous breed is due to frequent importations, regardless of expense, of sheep from Spain and from flocks of pure merinos established in Saxony and Silesia, in France (at Rambouillet), in South Africa (by Holland), and in the United States of America.

During the first decade of the history of sheep in Australia, grave doubts as to their possibilities were entertained by many of the colonists, and notwithstanding the enthusiasm of such pioneer breeders as Macarthur, Cox, and Marsden the early results were not convincing. This is not surprising, since the farms were all close to Sydney, where the country cannot be regarded as altogether suitable for sheep-raising. From the time, however, when Macarthur transferred his flocks to Camden and Cox settled with his at Mulgoa, there appear to have been no serious obstacles to the development of the industry, and, when more suitable pastoral country was revealed by explorers farther inland, rapid strides were made.

The industry owes much of its present-day prosperity to Macarthur's foresight and tenacity of purpose. Though in any case sheep would have ultimately demonstrated their possibilities, it was his firm faith that placed the industry upon a sound basis, and it is hard to say to what extent the early development of the colony was dependent upon the successful establishment of sheep-raising and wool-growing.

Of the three most noted pioneers, Macarthur, William Cox (q.v.), and Samuel Marsden (q.v.), the efforts of the two first appear to have had the most lasting and beneficial results. This is probably because Marsden bred for immediate utility; since mutton is said to have been at that time worth 2s. per lb., there was a great inducement to breed for meat. Meanwhile Macarthur bred for fine wool, in the firm belief that eventually it would become a valuable commodity, and his efforts were to secure the best breeding-stock obtainable. Encouraged by his success, and apparently holding the same convictions, Cox also concentrated on wool production. That the foresight of these two breeders was correct to an uncanny degree is confirmed by two facts: practically all the present merino stud flocks of Australia have been founded with sheep descended from their flocks, and Australian merino wool holds a pre-eminent place in the markets and mills of the world. Macarthur, strongly advocating the production of fine merino wool that would eventually supersede Spanish and Saxon wools in the English mills, realized the necessity of adhering rigidly to pure-bred stock, and no other strain was introduced into his flocks. This decision had far-reaching effects upon the evolution of the Australian merino.

In 1805 Macarthur settled at Camden Park, or, as it was then called, the Cowpastures. A small flock descended from the original stock is still kept there, and offers scope for study of inbreeding. John Ryrie Graham, writing of the Australian merino about 1870, says: 'I first saw Mr. Macarthur's celebrated sheep in 1826. They were smaller than the present day type, but very even. Their wool was exceedingly fine, but not dense. At that time they were undoubtedly the best in the Australian colonies.'

In 1821 wool from Macarthur's flocks realized as much as 10s. 4d. per lb. at auction in London, and at a fair held in Parramatta in 1822 rams were sold for as much as £300 per head. The demand for rams for breeding purposes was so great that by 1825 Macarthur could have sold twice the number bred. Sheep from this flock thus became distributed throughout all sheep-breeding parts of the colony.

William Cox established his flock at what was known as Brush Farm, situated somewhere near the present Eastwood; later he settled at Clarendon, near Windsor. In return for services towards the construction of the road over the Blue Mountains he received a grant of 2000 acres at Mulgoa; here his sons carried on the management of the flock, which was afterwards removed to Mudgee, where conditions were far superior and greater results were achieved. To improve the breed, Cox imported pure merino sheep from the Saxony and Gadegast flocks, and introduced them into the flocks at Mudgee, thereby producing wool of outstanding quality and eventually establishing the fame of Mudgee fine-woolled sheep. To such an extent did the quality of the Australian product improve that in 1878 E. K. Cox was awarded at the Paris exhibition the grand prix for samples of wool produced by him. At the earlier date, however, the fleeces were comparatively light, the average weight being about 4 lb. per head.

From 1825 onwards sheep-breeding in the colony rapidly developed and expanded, soon

becoming the chief pastoral pursuit both on the continent and in Tasmania. The number of sheep in the colony (which up to 1851 included Victoria and up to 1859 Queensland) at different dates will convey some idea of the expansion:—

1800	.....	6,124
1821	.....	290,158
1843	.....	4,804,846
1850	.....	16,000,000
1891	.....	61,000,000
1902	.....	30,000,000
1925	.....	42,925,177

In 1902 a disastrous drought had depleted the flocks.

The second phase in the evolution of the sheep and wool industry of Australia—i.e. between 1825 and 1880—was marked by (*a*) the development of large holdings (or stations) by companies and private individuals ('squatters,' see PASTORAL INDUSTRY), (*b*) sustained efforts to improve the fineness of wool, (*c*) variations in the method of controlling flocks. In the successful evolution of the Australian merino the squatter has been the principal factor. The large stations established stud flocks for the purpose of producing high-grade stock. Such flocks consisted of animals specially selected for their superior quality and pure breeding—a system which not only raised the standard of the flock sheep in general but also maintained pure-bred stock of known origin. The system became fairly general, and the eagerness of flock-masters to secure good breeding-stock may be seen from the following prices realized for merino rams:—

1825 John Macarthur (N.S.W.) merino rams, £300
1874 James Gibson (Tas.) 'Sir Thomas,' 714 gns.
1885 D. Taylor (Tas.) 'Hercules,' 1150 gns.
1896 James Gibson (Tas.) 'President,' 1600 gns.
1906 Haddon Rig Stud (N.S.W.) 'Dandy Dinmont,' 1500 gns.
1915 Executors of late F. C. Body (N.S.W.) 'Lord Charles,' 2000 gns.
1925 F. B. S. Falkner (N.S.W.) 'Birdwood,' 1500 gns.

In 1883 the very high sum of £3150 was paid to John Cummings for a ram, 'Lustre,' from the Terrannallum stud flock. Every year thousands of rams are now sold at high prices for breeding purposes; it is stated that the return from such sales on a certain New South Wales station for 10,000 rams amounts to over £100,000. At the annual stud sheep-sales held in Sydney during July 1926, stud and flock sheep were sold for approximately £100,000. The highest price paid was 1300 guineas for a stud ram from the noted Haddon Rig flock; 1000 guineas each were paid for four rams from the Austin Wanganella stud. The highest price obtained for a Tasmanian ram was just under 200 guineas. See SHEARING and WOOL.

Wanganella strain.—While during this period breeding efforts were mainly concentrated on the production of fine-fibred wool, the celebrated Wanganella flock was established in 1858, and, with the failure of fine-woolled sheep in the hot dry districts of New South Wales and Queensland, its fine-fibred wool came into great prominence. But it was later shown that strong wool alone did not meet the requirements. The original sheep, of Bayly (Havilah) blood, were from Canally; subsequently Rambouillet rams were imported and used in the flock. One of these ('Emperor') was remarkably prepotent, and the excellent and permanent qualities transmitted by him were mainly responsible for the present-day qualities that have made these sheep famous throughout Australia and South Africa.

This brings us to the third phase in the evolution of this noted breed and to a marked improvement in the weight of fleece.

Coonong stud.—In the production of heavier fleeces, the efforts of Sir Samuel McCaughey (q.v.) are worthy of special note. He purchased Coonong about 1860, and founded a flock with ewes of the Camden strain and Bayly (Havilah) rams; soon afterwards stud sheep were purchased from R. Q. Kermode of Mona Vale, Tasmania.

In the early eighties, with the object of improving the density of the fleeces, McCaughey conceived the notion of infusing Vermont blood, and in 1886 imported both rams and ewes at a total cost of £50,000. Some of the strain (through the progeny of Old Grimes, the famous Vermont ram of that date) had been already introduced in 1865. The yolk and loose skin (wrinkles) ultimately condemned the breed, but the experiment showed the Australian breeder that bigger neck-folds and better thighs and covering could be put all over the sheep by selections from local Australian blood.

The obsolete method of controlling sheep by shepherding was gradually superseded by the more modern system of enclosing the holdings with a sheep-proof fence. Although producing extremely fine-fibred wool, the sheep did not carry heavy fleeces, the average yield per head being about 5½ lb.; moreover their conformation left ample scope for improvement. In 1905 the average weight of fleece per head had increased to over 7 lb. The sheep were also extremely well-covered, being wool from the 'nose to the toes.' But the exaggerated development of fold and wrinkle had its drawbacks, the evenness of both wool and pelt being adversely affected, and the present high standard in sheep has been reached only by selection eliminating the wrinkles. Incidentally, the arrival of the blowfly pest synchronizes with the advent of the wrinkly sheep.

To summarize: Australian breeders had, at various periods, imported breeding-stock from all the different flocks that had been established from the Spanish merino, namely, the English flock of King George III, the Dutch flock from The Cape Colony, the flocks of Saxony and Silesia, the French flock from Rambouillet, and, lastly, the Vermont flocks of the United States.

The fourth, and present, phase in the history of the Australian merino (1910-1926) is that in which plain-bodied sheep with a large frame gradually replaced the wrinkly type that had been so popular during the previous decade. Thus the Wanganella strains of merino gradually rose in demand, not only in the different States of the Commonwealth, but also in South Africa. During the past 10 or 12 years many thousands of pounds worth of stud merino sheep, both rams and ewes, have been imported into South Africa from the best flocks of New South Wales, Tasmania, and South Australia. The greatest demand is for the plain-bodied type. By developing size of frame, length of staple, and maintaining density the weight of fleece has increased to over 8 lb.

The principal factors contributing to this change, which has been adopted throughout the greater part of Australia, are (*a*) the general utility of the type both for wool and mutton, (*b*) the more robust constitution of the sheep and its greater resistance to drought, (*c*) the greater immunity from the blowfly, and (*d*) the

greater value in either fat stock or store-stock sale-yards. With the growing demand for mutton, mainly through the development of the export trade, together with the expansion of cultivation (chiefly wheat-growing), the effects of which will be explained below, the various British breeds (see *Breeds* below) became more prominent during this period, especially for the production of crossbreds.

Victoria.—The first draft of sheep was brought over from Tasmania in December 1834 by Frank Henty (see HENTY, EDWARD). Other settlers followed, and within two years there were over 40,000 sheep in what is now the State of Victoria. Stations were established and the flocks soon attained to a high standard of quality. In 1870 sheep had increased to 10,000,000; the maximum number, 18,000,000, was reached in 1918. At the present time (1926) there are about 12,000,000 in the State. Victoria has always produced commercial wool of a very high grade. It is known as 'Port Phillip' wool, and is held by manufacturers in high esteem for its length of staple, fineness of fibre, brightness and purity of colour. Its outstanding feature is its comparative freedom from foreign matter and therefore usually commands higher prices per lb. than that from other States.

Queensland.—Although Queensland was not constituted a separate colony until 1859, the pastoral industry was well established long before. Soon after Cunningham discovered the fertile Darling Downs in 1827 flock-owners from New South Wales extended their interest to that district and established stations and flocks, the sheep being of Macarthur and Bayly blood. In 1850 there were over 1,000,000 sheep in the Moreton Bay and other northern districts. How rapidly they increased will appear from the following figures:—

1860	3,500,000
1880	7,000,000
1900	10,340,000
1925	19,186,516

The country is particularly well adapted for sheep. It is fertile, and the native pastures, such as the Mitchell and Flinders, are excellent for either fattening or wool-growing. The leading stud-flocks of New South Wales and South Australia are extensively drawn upon for rams. The wool produced is of excellent quality, and is noted for its length of staple, soundness, purity of colour, and good yield.

Tasmania.—The first Tasmanian settlers took with them 32 sheep, but sheep-breeding to any great extent was not carried out until 1819, when stock from Macarthur's flocks was first introduced. In 1825 the Van Diemen's Land Company (q.v.) was formed to develop the pastoral industry in the island. Special consideration was given to the production of fine wool, and pure-bred sheep from the best Negretti and Saxony flocks were imported. There are now (1926) about 1½ million sheep in the State. For many years the Tasmanian stud merino sheep have been held in high regard among the breeders of fine wool, and large numbers have been exported annually, not only to the mainland, but also to South Africa. At the stud sheep-sales of both Sydney and Melbourne they generally command good prices, although the demand has in recent years diminished because of the wider use of Riverina strains.

South Australia.—Sheep were first introduced in 1837, the flocks being founded principally from the best New South Wales and Tasmanian strains. To ensure improvement high-grade breeding-stock was from time to time obtained from the flocks existing in other colonies; at the present date (1926) many stations have what are justly recognized as among the leading stud-flocks of Australia. Under the dissimilar natural conditions a distinct type of merino has been evolved. So distinctive is it that it is commonly known as the 'South Australian' type. These sheep are noted for their strong constitutions, large robust frames, plain bodies, and heavy bulky fleeces. The wool has a shafty staple, and ranges from medium to strong combing; it frequently carries more or less red dust. The flocks now comprise about 6½ millions.

Western Australia.—Merino sheep were first introduced in 1829 from Tasmania, and were supplemented by importations from New South Wales. Here, too, the flocks rapidly increased, until there are now (1926) about 6½ million in the State. The country is generally well adapted for sheep, although it is not so favourable as that of the eastern States for the production of high-class wool. In the south-western portion there exist many excellent flocks, which have been raised to a high standard by the introduction of stud sheep, mainly from the best Riverina and South Australian strains. Because of the more exposed and dry conditions, the wool carries a considerable quantity of heavy red dust, which detracts from its value.

Other Breeds.—Whereas pure merino forms the greater portion of the flocks of the Commonwealth, it is by no means the only breed of sheep kept. During the past 25 years radical changes have taken place in large areas that were formerly devoted to sheep-breeding and wool-growing. Owing to the greater return obtained from small holdings, and to the suitability of the country for the purpose, wheat-growing has taken the place of sheep in what is known as the 'wheat belt.' This has resulted in closer settlement, and though there is nevertheless considerable scope for keeping sheep, the merino is not adapted for the purpose. The British breeds, on the contrary, possess many qualities which make them suitable for keeping in conjunction with wheat-farming, and they have consequently come into prominence. Crossbred sheep from these and the merino are, for this particular purpose, of greater value than either of their progenitors, as in a large measure they combine the characteristics of both the original breeds. The British breeds excel for mutton; the merino is superior for wool. On small holdings, therefore, the crossbred, which offers the various possibilities of good returns—for wool production, mutton, and fat-lamb raising—is more profitable than the merino. The latter gives the best results when kept in large numbers and on the natural pasture; it is not, like the crossbred, well adapted for the confinement and constant handling associated with feeding off crops, stubble-land, etc. The crossbred is docile and contented in disposition—both qualities, inherited from the English progenitor, being necessary for fattening. Furthermore, the crossbreds command better prices when sold as fat sheep or lambs; they mature earlier, a fact which adds to the quality and brings quicker returns.

In the production of crossbreds two distinct English types are used, namely, the long-woolled breeds, such as the Lincoln, English Leicester, Border Leicester, and Romney Marsh; and the

short-woolled breeds, e.g. the Shropshiredown, Southdown, Dorset Horn, Suffolkdown, and Hampshiredown. The former group produce heavy fleeces of a long staple and more or less lustrous colour and silky texture; the fibre is strong. When crossed with the merino, the progeny is a good type of utility, or dual-purpose, sheep. The short-woolled breeds, on the other hand, are noted for their prime mutton, early maturing, and symmetrical conformation. They are, therefore, well adapted for crossing with a view to the raising of fat lambs.

The disadvantage of cross-breeding lies in the difficulty of obtaining continuity of type; a desirable type of crossbred flock can be maintained only by repeating the process of breeding from the original cross. To overcome this difficulty there has been evolved a new breed, peculiar to Australasia. It is now recognized as a distinct breed (known as the 'Corriedale'), and possesses the most valuable characteristics of the best type of dual-purpose crossbred. In all the States the system of cross-breeding is at present carried on, and is increasing.

Effects of environment.—Although the natural conditions prevailing in Australia are generally very suitable for sheep and the production of wool, yet it is only to be expected that the pronounced variations of climate, rainfall, pasture, and elevation should manifest their effects in the sheep and its covering, and should produce a variation of type and general character. On the tablelands of the eastern States the climate and pasture are conducive to the production of fine wool. The winter is, however, in those parts much longer and more severe, with the result that the sheep are not so well nourished throughout the year; as a consequence, neither the frame nor the constitution is so robust; the wool, however, is fine, dense, and well maintained in quality throughout the whole staple. The open plain country, especially in the warmer regions, produces a larger and more vigorous type of sheep, but the wool, although of useful quality, is inferior to that produced on the tablelands, since the heat and dust cause the fleeces to become somewhat wasty at the tip, especially on the back. To counter the injurious effects of the climate it is necessary to maintain size of frame together with body and substance of wool. Even on the tablelands the conditions vary to a considerable extent. In New South Wales the New England district is noted for the superior quality of the wool; some of the finest spinning wools in the world are grown in this region. Parts of the southern tablelands also produce wool of high quality. The Yass and Goulburn districts enjoy conditions for wool-growing similar to those of New England or the western districts of Victoria.

The natural conditions throughout Victoria are eminently adapted for the production of fine wool; the country is very clean, and the Victorian clips are noted for their high yield and attractive appearance, though the sheep are not so robust in frame as those of the Riverina or South Australia. The Queensland conditions cause considerable variation in both sheep and wool. In the south-eastern corner fine-woolled sheep are kept, but generally the stronger-woolled type is favoured. The more tropical conditions tend to develop an effeminate kind of wool—a defect which is corrected, as in the western districts of New South Wales, by employing robust, vigorous rams. In South Australia, where the rainfall is limited, sheep of great stamina are bred; this type gives astonishing results even where the fall is as low as 14 inches. Naturally the wool is more or less defective at the tip and sometimes carries much dust, but otherwise it is of a very useful type. Western Australia, with its exposed and dusty country, is also unsuitable for the growing of fine wool; the strong-woolled types are better adapted to the conditions. Generally speaking, fine wool can be grown to the highest state of perfection in the eastern portions of the eastern States and in Tasmania.

Diseases.—As a general rule the sheep throughout Australia are sound. This fact is largely due to the comparatively dry conditions and the vigilance exercised in preventing the introduction of contagious diseases. Even in those areas where the rainfall is heavier, only the more common diseases, such as infestation with internal parasites, or foot-rot, are experienced; in wet seasons foot-rot is prevalent over very extensive areas where the country is flat. The most serious diseases peculiar to sheep in other countries, namely foot-and-mouth diseases, are as yet unknown in Australia; fortunately an outbreak of scab at an earlier period was completely checked. The causes of such diseases as do occur are not altogether uncontrollable; among these are overstocking, indifferent attention, and unsuitable, sour country. The most common diseases are fluke, worms (intestinal and lung), black disease, anthrax, and foot-rot. In many localities sheep are frequently infested with external parasites, of which the most common are sheep-tick and sheep-lice. In recent times great losses have been sustained from the ravages of the blowfly. Inland, where the climate is drier, few of these ailments occur except anthrax, which develops occasionally. See BLOWFLIES, LIVER-FLUKES, and SHEEP-TICK.

Effects of the export mutton trade.—The development of the export mutton trade has been a boon to Australian breeders; it has also had far-reaching results upon the evolution of the merino. Before the establishment of the industry, sheep were of comparatively little value except for the production of wool; between 1880 and 1890 it was a common practice to slaughter the older sheep and boil the carcasses down for the fat. When once the country became fully stocked, there was practically no means of disposing of the surplus stock, and the rapid increase in the number of sheep with a succession of favourable seasons made the danger of overstocking very pronounced; the profitable disposal of this surplus stock was, therefore, a matter of vital importance to the welfare of the pastoral industry. As local requirements were satisfied, the only solution of the problem appeared to lie in the exploitation of markets overseas—that is to say, in the establishment of an export trade in mutton. This was made possible by the introduction of freezing (see HARRISON, JAMES), more especially when steamships were equipped for the purpose. Thenceforth mutton not only became of greater value, and consequently a more important product, but the demand had a material effect upon the evolution of the merino, breeders being encouraged to develop to a greater extent the mutton qualities of the sheep.

Although the system of exporting frozen mutton was introduced in 1881, it was some years before the industry was firmly established. The

following figures will show the expansion of the trade:—

		lb.	Value.
1896	(from N.S.W.)	65,664,000	£278,157
1901	(from the C'wealth)	62,288,326	726,276
1906	,, ,,	90,692,000	1,095,120
1910	,, ,,	190,230,000	2,161,500
1915	,, ,,	193,264,000	3,418,848
1920	,, ,,	247,000,000	5,483,000
1925	,, ,,	50,271,000	1,522,000

The figures for 1901 reveal a reduced shipment as compared with 1896; the disastrous drought prevailing in 1900-2 was responsible for this falling off.

During the year 1919-20, in consequence of the release from restrictions of shipping space, coupled with the satisfactory prices realized in England, the above record shipment was made. In 1925, through a dearth of supplies following upon droughty years, together with poor lambing, and also through the fact that wool was commanding high values and therefore owners were induced to hold their sheep, the quantity of mutton and lamb exported was greatly reduced. The principal customer of Australia for this trade is England, where about 95 per cent of the quantity exported is absorbed; the remainder is taken by Sweden, British Malaya, Egypt, China, and Ceylon.

C.E.C.

Sheep- and Cattle-dogs. For the handling of sheep over her wide spaces it has been necessary for Australia to evolve a special breed of dog; the old-world sheep-dog would be of little use. This breed is the kelpie, a smooth-haired, prick-eared, active dog of about the size of a smooth-haired Scotch collie. It has four varieties of colour—the black-and-tan, the blue, the red, and the black (usually known as the barb). These types differ somewhat in both appearance and character. The black-and-tan is the most sensible, dependable, and hardy; it is also more sensitive than the others to correction. The blue (a slate or smoke blue, generally with a white patch on the chest) closely resembles the black-and-tan, but is less sensitive. The red is a smaller and more foxy-looking dog, with hazel eyes (whereas the others have brown). The barb, or black, is the stoutest in build, and is the best for cross-bred or English sheep, but not so good as the others for the merino.

No day is too hot, or cold, or long for the kelpie. Endowed with muscles of steel and a coat that defies all weathers, he finds it all the same whether the heat be 110° in the shade or the biting winds and sleeting rains are sweeping across the plains and chilling the larger stock to the bone. Away on either wing, far enough out for the wild merino sheep not to take fright and so split in all directions, he gallops with his long, tireless stride; or, when his wisdom tells him that they need it, stops and stands like a statue facing them, then drops to the ground for a space and creeps towards them like a dingo stalking game, till they turn and go the way he wishes. If they break away at the gate—their age-old instinct impelling them to turn away from anything that looks like a trap—and race across the plain, the kelpie, with an equally age-old instinct impelling him, gallops parallel with them and just in sight, till they stop and look at him. Then he comes in towards them step by step, dropping flat at the least sign of their splitting, and creeping on to them again till they turn back and run towards the gate. The only thing that can upset the kelpie's working is the bindi-eye (see NOXIOUS PLANTS), a wretched little three-cornered thorn which grows thickly in certain places on the plains, and which sticks in his feet; but when this happens his owner shoes him with little boots of basil, and he goes on working as usual.

This wonderful breed was evolved between the years 1870 and 1880. When Australia was first settled and the merino industry began to make headway, the flocks were small, and needed constant protection from the blackfellow and the wild dog. They were therefore always shepherded and 'folded' at night; and, being so much handled, their natural wildness sobered down, and they could be worked by the old rough Scotch collie. As their numbers increased and they spread out on the western plains, it was no longer possible to shepherd them; moreover, by this time the natives and the dingoes had either been driven out or brought under control. The old style of sheep-dogs, mostly the rough-haired collie and crosses of it, now proved unsuitable for working the large flocks, especially in the summer, the merinos having reverted to their old wild habits when given a wide range. The squatters therefore cast about for a better dog, and two of them—Elliot and Allen, of Geraldra station near Forbes (on the Lachlan River, New South Wales)—heard of a wonderful strain of smooth-haired collies in Scotland (Rutherfords being the breeders), said to have in them a strain of fox, and consequently silent, wide workers. They thereupon sent for a pair, which duly arrived. Both were smooth-haired, prick-eared, black-and-tan collies; the one was named Brutus and the other Jenny, and they were locally known from their appearance as the 'fox-collies.' On their arrival Jenny had a litter of pups (sired by Brutus on board the ship), all black-and-tans except for a little red one just like a fox. This one went to Phil Mylecharane, who was then buying stud rams from the partners for T. S. Mort and Company. To satisfy him that the red pup was not a freak, they wrote to Rutherfords, who replied that in almost every one of their litters a red fox pup occurred. The best pup in Jenny's litter was a black-and-tan called Caesar. About this time (1870) a Mr. Gleeson came over to the district from Victoria, bringing with him a fine black-and-tan sheep-bitch called Kelpie. Her pedigree is unknown; but, judging from her appearance, she was a cross of the black-and-tan collie with the dingo. She was mated with Caesar, and produced a litter, of which one pup resembled her so strongly that it also was called Kelpie. This pup went to C. B. W. King, of Wollongough station near Forbes. At 12 months old she competed at Forbes in the first sheep-dog trial held in the Commonwealth, and won easily. Her pups therefore became in great demand; at first they were called 'Kelpie's pups,' but their progeny simply 'kelpies;' hence the name of the breed.

The barb is an offshoot from the kelpie. A son of Caesar's—a black dog called Moss, owned by one Cox of Merringreen station near Forbes—was mated with Sally, one of Kelpie II's pups. She produced a fine litter, among which was a black dog pup, resembling his father. This pup was given by Cox to a stockman named Davis, who was working for him at the time. Davis called the pup Barb, after the black race-horse who won the Melbourne Cup. When Barb was full-grown, Davis went down the river to work at Edol's Burrawang station. Edols was so struck with Barb's work that he bought him and kept him as a sire. His progeny turned

Drawn by Edith A. King.

1. Green Tree-snake (*Dendrophis punctulatus*).
2. Yellow-bellied Sea-snake (*Hydrus platurus*).
3. Carpet Snake (*Python spilotes* var. *variegatus*).

out great workers; they were nearly all black like himself, and were called 'Barb's pups,' but their progeny simply 'barbs.'

The different colours and working are thus explained. The black-and-tan and the blue kelpies throw back to the smooth-haired Scotch collie in size, shape, and disposition; their 'wild' way of working they get from the fox and the dingo. The red kelpie, on the other hand, more closely resembles the fox, and is therefore much harder to control than the black-and-tan or the blue, though his method of working is the same. Meanwhile the barb more closely resembles the old black smooth-haired collie, and therefore works his sheep much more like the domesticated dog, i.e. close in, and with a little barking. Hence, while the others are used principally for working merino sheep in big paddocks, the barb is employed in smaller paddocks and for penning-up and yard work.

In recent years the kelpie has deteriorated through careless breeding; but efforts are now being made by the New South Wales Sheep-dog Trial Workers' Association to raise the standard to its old level. This is of vital importance to the pastoral industry, as moving stock without suitable dogs is very costly—it is proverbial that one good dog is worth three men.

The Cattle-dog.—As the Australian sheep-breeder had to evolve a special breed of sheep-dog by crossings, so did the cattle-raiser find it necessary to evolve a new cattle-dog by a blending of the native red dog (the dingo, q.v.) and the smooth-haired Scotch sheep-dog.

Although of three different colours (blue-speckle, red-speckle, and plain red) this animal is essentially the same—a thick-set, prick-eared dog, in shape, coat, and size a replica of the dingo. His method of working is also the same, no matter what his colour may be; namely, to follow horses or cattle and bite the hind heel (on which the weight is resting) of any straggler, dropping flat immediately afterwards, so that the consequent kick whistles harmlessly over him; to gallop to the head of the mob and swing it in any desired direction by snapping at the leaders' necks; to make any bullock stand to be yoked; to watch his owner's property anywhere and at any time; and to be mate, game-catcher, retriever, guard, and companion to his master. Such is the Australian cattle-dog, and it is interesting to follow the record of his evolution.

The first colonists brought with them a dog known as the black bob-tail—a few of his descendants are still to be found on farms in the older-settled districts. This was the old English cur-dog, a big, rough-coated (not grizzled), square-bodied animal with a wedge-shaped flat head and drop ears. Most of them had a white ring round the neck; some had white feet. These dogs were faithful and sensible, and in the early days, when the farms were small and the cattle quiet, they served their turn; but when the country was opened up and the stock had to travel long distances, they proved unsuitable, their heavy frames and long coats being against them, particularly in hot weather, as was also the barking to which they were addicted and which made the cattle wild and difficult to handle. To overcome these defects, a drover named Timmins conceived the notion of crossing this black bob-tail with the dingo, and thus originated the red bob-tail. But though this dog was a silent and hardy worker, he was a very severe biter and apt to kill calves when working out of the drover's sight. The next breed to be tried was a cross of the rough-haired collie and the dingo, but this type had the bad habit of running to the head and barking instead of working from the back and sides. A number of other crosses were tried, such as between the kangaroo-dog and the bull-dog, between the bull-terrier and the rough-haired collie, and between the latter and various breeds of rough-haired terriers; but these were all very severe biters and proved uncontrollable.

On the big cattle-runs which were coming into existence a silent, tractable, clean-biting dog was indispensable. Consequently in 1840 a squatter named Hall, at Muswellbrook, New South Wales, did a good deed for Australia when he imported a pair of blue-gray 'merles'—marbled or mottled smooth-haired Scotch dogs—which were said to be good at working cattle. This breed had its origin in a blend of the old English mastiff—who protected the herds from wolves—the greyhound, and the Scotch collie. But though merles were a great improvement on the previous breeds, they still had the old collie habit of barking and running to the head. Hall therefore crossed them with the dingo. The result proved a great success; the progeny had the dingo habit of creeping up behind and biting. They were at first known as 'Hall's heelers,' then as 'blue heelers;' and the pups came red-mottled or blue-mottled according to the strain—dingo or merle—which predominated. Most of them were prick-eared and of the dingo type, and had the dingo brown eye, though occasionally there cropped up the 'china' or white eye so prevalent in the merle.

About 20 years after Hall's importation, some of these dogs were brought to Sydney by Alexander Davis and they attracted much attention at Homebush sale-yards, where they were taken up by various drovers and butchers. As they were the result of a direct cross, a distinctive type was not fixed. The next move was therefore to infuse the blood of the Dalmatian or spotted carriage-dog, and subsequently that of the kelpie. The result, in the hands of skilful breeders, was a compact, active dog identical with the pure dingo in type and build, but with peculiar markings found in no other dog in the world. The face and ears are black or red, with a tan spot over each brown eye and a white stripe down the middle of the forehead; the body is a dark blue, evenly speckled with a lighter blue (whence the name 'blue-speckle'); there may be a black saddle or spot on the tail-butt (no more black being allowed); the tail and under part of the body are a lighter blue, the legs from feet to elbow and hock red-speckled. Blue-black, or from light to white, colours are barred; also 'wall' (or white) eyes. Rigid adherence to these markings is necessary, since they are 'utility' points. The black head shows kelpie strain, and hence keen working qualities; the red head, dingo strain, and hence great hardiness; the brown eyes show keen sight; the white stripe down the forehead and the black spot on the tail-butt show descent from 'Tom Bentley's dog'—one of the most perfect workers ever known. The dark-blue colour is indispensable to a dog doing so much biting—and therefore liable to get kicked—since dark blue is invisible, especially at night. Black, on the other hand, is very conspicuous in daylight, and white is so by either day or night. The red-speckled legs do not show the red dust in which the dog is so often working. The dingo type is insisted upon because it

denotes the strength and speed which are the results of natural selection during untold years under Australian conditions. R.L.K.

Sheep-tick. In England, Europe, and South Africa sheep are infested with various species of tick belonging to the genera *Ixodes*, *Rhipicephalus*, and *Amblyomma*. The pest called 'sheep-tick' in Australia, however, is not a true tick but a wingless fly (*Melophagus ovinus*) of the family Hippoboscidae; it occurs wherever sheep are found within the Commonwealth, though most States endeavour to minimize its evil effects by compulsory dipping of some sort. The constant irritation set up by its bites makes sheep rub and even bite themselves, thereby damaging the wool and lowering their condition. It has been estimated that the resulting loss amounts to at least 6d. per sheep per annum. The fly's life-history is peculiar; instead of depositing eggs or larvae in a batch, as most flies do, the mother produces a single larva, carries it within her body until it is full-grown, and then extrudes it—whereupon it immediately changes to the pupal form, and within a few days undergoes its final transformation into the 'tick.' Allied, but winged, species occur on various Australian birds, especially on owls and swallows.

Sheil, Lawrence Bonaventura (1815-1872), born at Wexford in Ireland on 24 December 1815 and educated at Enniscorthy and the Franciscan convent of St. Isidore in Rome, was ordained priest in 1839, lectured on philosophy at St. Isidore's, returned to Ireland to become head of the Franciscan order there, and in 1852 accompanied Archbishop Goold to Melbourne. There, after some years as professor of theology and philosophy at St. Patrick's college (of which he became president), he was in 1859 made archdeacon of Ballarat, and in 1866 succeeded Dr. Geoghegan as bishop of Adelaide. His administration of the diocese was marked by a rapid growth of the Church in South Australia, and by his personal attendance at the oecumenical council of 1870 in Rome. He died at Willunga on 1 March 1872. E.M.O'B.

Sheldon, Sir Mark, born at Armidale in New South Wales on 11 November 1871 and educated at Riverview College (of which he was one of the earliest students), St. Cuthbert's College at Ushaw in Durham, England, and the university of Sydney, entered the firm of Dalton Brothers in 1890 and in 1902 was made managing director. In June 1919 he succeeded Sir Henry Braddon as Australian commissioner to the United States, in 1922 was a representative of the Commonwealth at the annual meeting of the League of Nations, and in 1924-5 was a member of the British economic commission sitting in London. In 1925 he returned to Australia and resumed his commercial career. (Kt. Bach., 1922; K.B.E., 1925.)

Sheldrake. See Ducks and Geese.

Shells. See Mollusca.

She-oak, a name popularly given to trees and shrubs of the genus *Casuarina*, the only genus of the family Casuarinaceae, under which heading they are botanically described. The name was first given them by early timber-getters, because the grain of *Casuarina* timber was thought to resemble that of English oak; R. Pickersgill in his journal kept on board the *Endeavour* (1769-71) mentions 'a wood which has a grain like Oak . . . . the leaves are like a pine leaf,' and G. Thompson in a journal of 1793 writes of 'two kinds of oak, called the he and the she oak, but not to be compared with English oak.' The prefix 'she' is commonly used by timber-getters to indicate inferiority; thus they talk of She-beech (*Cryptocarya obovata*) and She-pine (*Podocarpus elata*) because they think the timbers of these trees are like beech and pine respectively, but not

Casuarina suberosa.

so good. Other alleged derivations of 'she-oak' may be ignored, as they assume the existence of words—aboriginal or Red Indian—which in fact do not exist.

Colonial-brewed beer used to be called 'she-oak' in disparagement, to indicate that it was inferior to English-brewed beer.

Sherbrooke, Lord. Robert Lowe, first and only Viscount Sherbrooke (1811-1892), born at Bingham, Nottinghamshire, on 4 December 1811 and educated at Winchester School and University College, Oxford (B.A., 1833; M.A., 1836; hon. LL.D., Edinburgh, 1867; D.C.L. Oxford, 1870), in 1835 was elected to a fellowship at Magdalen College, Oxford, and on 1 May was admitted to Lincoln's Inn, where he was called to the bar on 28 January 1842. He took part in the Tractarian dispute, and published in 1841 an anonymous pamphlet *The Articles Construed by Themselves.* In 1842 he migrated to Sydney, and was admitted to the New South Wales bar on 18 October. On 7 November 1843 Sir George Gipps nominated him to the legislative council, in which he soon became an authority on financial and educational subjects. In 1844 a quarrel with Henry McDermott (for which see Duelling) caused the council to demand (*a*) that its members should be legally protected against being called to account outside the house for words used in

debate, (*b*) that a criminal information should be filed against McDermott and his supporters. Strong public protests prevented the granting of the first demand, the second was vitiated by informalities, and Lowe found himself for a time exceedingly unpopular. He also quarrelled with Governor Gipps, and in September resigned his nominee position in the council, but was returned to it in April 1845 as elected member for the counties of St. Vincent and Auckland. Thenceforth he was more or less an Ishmael, on the one hand attacking Gipps's administration and on the other bitterly opposing Went worth and his squatter friends in matters of land policy; he succeeded, however, in procuring the abolition of imprisonment for debt and the formation of a national board of education—two valuable victories for a private member. In July 1848 he was elected to the council by the city of Sydney after a hot campaign against the dominance of the squatters. In 1849 he found his chance of heading a great popular movement when the British authorities attempted—with the support of Wentworth's party—to revive transportation to New South Wales. At a meeting on 18 June he delivered what was probably the finest speech of his career, both as a serious argument against the landing of convicts and as a bitter satire on Governor Fitzroy. During these years he was also indirectly appealing to the public in the columns of the *Atlas*, a weekly newspaper established by himself and several friends in 1844 mainly as an anti-Gipps organ and continued until 1848 on lines of general opposition to Fitz-Roy and the colonial office. Lowe was by nature an oppositionist. He was the only New South Wales member who in 1844 supported the representatives of Port Phillip in their demand for immediate separation; in 1848, for once joining Wentworth, he denounced Earl Grey's proposals for the separation of Port Phillip, a bicameral legislature, and some form of loose federation as 'this damning proof of colonial office tyranny;' in later years in England he attacked important clauses of various bills to establish colonial constitutions, some because they were originated by the colonial office, others because they were originated by the colonial legislatures. His attacks were not always arbitrary or unjustified—but it was evident that the joy of combat stimulated him more than the rights or wrongs of the case.

Early in 1850 he decided to return to England, and signalized his arrival there by a denunciation of the single-chamber system delivered before the Colonial Reform Society on 1 June. He was then taken on the staff of *The Times* as leader-writer, and continued for many years to influence strongly the views of that newspaper on colonial politics. Soon began a long and important career in the house of commons, where he sat for Kidderminster (1852-9), Calne (1859-67), and the university of London (1868-80). When the bills for granting constitutions to New South Wales and Victoria were before the house, he happened to be out of office, and used his freedom to criticize them severely; otherwise he became a purely British politician, and took little further interest in Australia.

This portion of his life may be briefly summarized. He held minor offices in the ministries of Lord Aberdeen (1852-5) and Lord Palmerston (1855-8, except for the period February-August 1855); in Palmerston's ministry of 1859-65 he was minister for education, and devoted himself to his department, but resigned in April 1864; when the Russell ministry of 1865-6 brought in a reform bill, he attacked it with equal eloquence and bitterness, and was the main instrument in achieving its defeat. In the Gladstone ministry of 1868-74 he was at last admitted to the cabinet as chancellor of the exchequer, and for three years budgeted successfully, but in 1871 almost wrecked the ministry by a proposal to tax lucifer-matches. In 1873 he was transferred from the exchequer to the home office. Gladstone went out of office in 1874, and Lowe had no further chances of official life. His eyesight began to fail, his memory weakened, and in 1880 he retired into private life, and was elevated to the house of lords. He died at Warlingham in Surrey on 27 July 1892.

Apart from politics Lowe's wide reading and high intelligence made him notable among the learned of his day. He was in his later years a fellow of the Royal Society, a trustee of the British Museum, a senator of the university of London, and a welcome speaker before learned societies. (P.C., 1855; G.C.B., 1885.)

J.V.C.-B.

Shiels, William (1849-1904), born in Ireland in 1849 and brought to Victoria by his parents while still a child, was educated at the Scotch College and the university of Melbourne (LL.B., 1873; LLM., 1876) and called to the Victorian bar in 1873. In 1877 he was returned to the assembly for Normanby as a conservative and freetrader; but his chief political achievement was the extension of women's rights in connection with divorce. In 1890 he became attorney-general and minister for railways in the Munro ministry; he paid particular attention to railway reform, and the amending railway management bill of 1891 was his work. In 1892 he succeeded Munro as premier and treasurer, in 1899-1900 was treasurer in the McLean ministry, and treasurer and minister for railways in the Irvine ministry (1902-4). He died in 1904.

Shillinglaw, John Joseph (1830-1905), born in London in 1830, studied in 1844-52 under Admiral Washington, then hydrographer to the navy, but in 1852 abandoned his studies to accompany his father to the Australian goldfields. Arrived in Melbourne, however, he decided that security of employment was better than the chance of winning a great fortune at the diggings, and obtained an appointment as chief clerk to the Williamstown magistrates. In 1854-6 he acted as superintendent of the water police, and in 1856 was made shipping-master to the port of Melbourne; retiring in 1869, he was taken back into the public service in 1875 and employed as secretary to several official bodies, among them the central board of health. He died at Melbourne on 25 May 1905.

Shillinglaw's official career was less important than his researches into early Australian history. In 1870 he acquired the *Colonial Monthly Magazine* to serve as a receptacle for miscellaneous historical information; in 1878 he disentombed from the archives of the colonial secretary's office at Sydney a number of documents bearing on the early history of the Port Phillip settlement, which were published in 1879 by the Victorian government as *Historical Records of Port Phillip*. He had previously written a good deal for the British and Australian press, in 1858 published a shipmasters' guide for Victorian mariners, in 1859 a book on

Arctic discovery, and in 1865 edited Musgrave's *Castaway on the Auckland Islands.*

Shipbuilding. Phillip's instructions included one that he should not allow any craft of any sort to be built whereby communication could be held with India, China, or the islands. Those built in the early years, therefore, were intended either for use in the harbour or for bringing the produce of the Hawkesbury district to Sydney. The first vessel built, the *Rose Hill Packet,* was a 10-tonner plying up the Parramatta River; it was launched in October 1789. A sloop of 25 tons was built in 1798 at Norfolk Island—the *Norfolk,* in which Flinders and Bass sailed round Tasmania. In 1796 Hunter enclosed a naval yard on the western side of Sydney Cove, and there in 1800 was launched the schooner *Cumberland* (28 tons), in which Matthew Flinders (q.v.), after the loss of the *Porpoise,* sailed for England. Other vessels built in this yard were the brig *Portland* (160 tons) and the sloop *Integrity* (59); but its pride for some time was the *Elizabeth Henrietta* (150), whose keel was laid by Hunter in 1800; she was launched by Macquarie on 13 June 1816, and it is satisfactory to know that after all this delay she proved 'a very handsome and valuable acquisition to our maritime concerns.' The first vessel laid down in the colony in a private yard, for trading purposes, was also of slow growth—the sloop *Contest* (44 tons), begun at Underwood's yard in 1798 but not launched until May 1804. A return dated 28 February 1804 shows among the craft lying in Port Jackson 16 vessels which had been built at Sydney and five built on the Hawkesbury; they were employed in the Hawkesbury trade, in bringing coal from Newcastle, and in sealing in Bass Strait—the largest was a 38-tonner. The *King George* (185 tons), destined for the whale fishery, was built at Underwood's yard for Kable and registered on 4 February 1805. No vessel could be built without the governor's sanction, and bonds had to be given that they would not trade beyond New South Wales and its dependencies. In 1813, however, the East India Company's monopoly came to an end, and shipbuilders were able to build vessels for trade in the Indian and Pacific oceans.

In 1821 John Grono commenced shipbuilding on the Hawkesbury near Pitt Town; among those launched there were the *Elizabeth* (130 tons), the *Industry,* the *Australia* (300), and the *Governor Bourke* (240). As late as 1866 his son, another John Grono, built the *Maria,* 'which had considerable passenger accommodation.' Higher up the river, at Richmond, the brig *Glory* was built in 1819, and at least nine others between 1831 and 1843. At Brisbane Water shipbuilding was a thriving trade, several yards turning out great numbers of small coasting-vessels; in 1895 Rock Davis launched from his yard near Woy Woy the 120th vessel built there. Many steamers now in use on the ferry routes in Port Jackson came from this yard.

As settlement extended northward, and suitable timber was located, shipbuilding yards were opened on the northern rivers. At Clarence Town, on the Williams River, Marshall and Lowe built in 1831 an early coastal steamer, the *William the Fourth,* and in 1835 the *Ceres.* The timbers used were flooded gum and ironbark, with decks of Norway pine. The steamer *Kangaroo,* which for many years was used in Hobson's Bay as a ferry to Williamstown, was built at Raymond Terrace on the Hunter River in 1840. In 1839 Alexander Newton, previously master of an oversea trader, discovered on the Manning River suitable timber for shipbuilding, and in the following 44 years launched from his yard there a large number of schooners, brigs, and barques. William Nicholson also established a yard there, and in 1844 built the brig *Triton* (143 tons), which was still trading between Cardiff in Wales and Belfast in Ireland 63 years later. In 1847 Nicholson built the barque *Fanny Fisher,* which traded out of Sydney for nearly 60 years. All along the North Coast practically every river had its shipbuilding yard, and often the newly built vessels were sent to Sydney with cargoes of timber for shipyards at Pyrmont and Balmain. The South Coast also had a share of this activity, but South Coast timbers were found less suitable for shipbuilding.

In Sydney itself Thomas Chowne, of Johnston's Bay in Balmain (1840-60), was one of the principal builders of his day, and many steamers and schooners came from his yard. Lawrence Corcoran, who had been carpenter in Ben Boyd's *Seahorse* (see BOYD, BENJAMIN), established a yard in 1844 in Darling Harbour near Miller's Point; in the early 1850s his business was taken over by John Cuthbert, who in 1855 built the *Spitfire,* 'the first war vessel built in the colony'—a 60-ton ketch armed with a 32-pounder gun on a traversing carriage. He also built in 1872 for the British naval authorities five schooners for patrol work among the South Sea islands; these, the *Alacrity, Beagle, Conflict, Renard,* and *Sandfly,* mounted one gun each, and were commanded by lieutenants of the royal navy. They were sold out of the service in 1882 and 1883.

At Melbourne several yards were established on the Yarra, and on 27 January 1848 the barque *Jane Cain* was launched there for the wool trade with London. John Cruze built the schooner *Margaret Agnes* in 1850, and George Ward Cole (q.v.) the *City of Melbourne,* a screw-propelled steamer, in 1851; in the same year James Chessell built three small vessels for local trade, one of which, the *Clyde,* for many years traded with Geelong. Robert Finlay in 1865 built the *Reliance* in a Yarra yard. Shipbuilding also went on at Port Albert in Victoria, where the schooner *Colina* was built in 1848 and the steamer *Enterprise* some years later.

In Hobart many oversea ships were built by John Watson at Battery Point—in 1847 the schooner *Miranda* (127 tons), in 1848 the *Fair Tasmanian* (200) and the *Circassian,* in 1850 the barque *Panama* (350) and the *Middleton* (340), which was for some years in the Hobart-London trade. The *Derwent* (403), built for the same trade, and the *Runnymede,* which was for many years a whaler, were also built there. South Australia and Western Australia built sailing-ships and steamers for their local trade.

When iron supplanted wood, the country yards closed, and constructional work was practically confined to the large ports, especially Sydney. In 1851, when the Hunter River Steam Company was merged into the Australasian Steam Navigation Company, new steamers were ordered from England; the first of these to arrive, the *City of Sydney,* brought out 60 mechanics for workshops, and a patent slip was placed at Pyrmont. On 15 February 1853 the steamer *Ballarat* was launched; its plates and framework had been

brought out from England and were put together at Pyrmont. There too was built in 1863 the gunboat *Waikato*, a stern-wheel steamer with two cupolas, which was towed to theWaikato River by H.M.S. *Eclipse* for use in the Maori war. In 1864 the *Leichhardt*, a screw steamvessel of 690 tons, was built there, and ran in the intercolonial trade for many years; in 1865 the twin-screw steamer *Kennedy* (200 tons) was put together in less than three months.

In 1854 schemes were afloat for making Sydney a properly equipped shipping port. As there was at the time no dry dock in which to clean or repair the British warships on the station, by arrangement with the New South Wales government the Fitzroy dock at Cockatoo Island was constructed; the first vessel docked there was H.M.S. *Iris* in 1857. In 1854 Thomas Sutcliffe Mort (q.v.) constructed his dry dock at Waterview Bay in Balmain, completing it in 1856; here was built in 1872 the steamship *Governor Blackall* for the Queensland government, which afterwards passed into the Australasian Steam Navigation Company's service and ended her days as a Bulli collier. About 1884 the Atlas Engineering Company opened workshops at Woolwich at the junction of the Parramatta and Lane Cove rivers. The large imported floating-dock installed in 1888 has been in use ever since. In 1898 these works were taken over by the Mort's Dock Company (q.v.). Ways were also laid down, and the larger steamers used on ferry service between Sydney and Manly were built there. On Cockatoo Island a second dock, the Sutherland, was completed by 1889. In 1911 the destroyer *Warrego* was shipped from England in parts and put together at the Cockatoo dockyard; in the following year the Commonwealth took over the island for naval purposes. In 1913-15 the destroyers *Torrens*, *Huon*, and *Swan* were built there; in 1913 the keel of the light cruiser *Brisbane* was laid; she was launched in 1916, and a sister-ship, the *Adelaide*, was at once begun, and launched in July 1918. Two large cargo steamers, the *Fordsdale* (launched in 1923) and the *Ferndale* (1924), both of 12,500 tons, were built at Cockatoo for the Commonwealth. When that dockyard passed to the Commonwealth, the State government set about the construction of a shipyard at Walsh Island near Newcastle, where large steamers have been built, notably the *Dinoga*.

In Victoria the principal dock is the Alfred dock at Williamstown, the foundation-stone of which was laid by the Duke of Edinburgh in January 1868, the first ship being floated in on 2 March 1874. This dockyard has built for the Commonwealth ships of the same class as those built at Walsh Island.

Since 1918 the following vessels have been built in Australian yards for the Commonwealth government:—in 1919 *Dromana* (3305 tons), *Delungra* (3334); in 1920 *Dinoga* (3339), *Dumosa* (3315), *Dundula* (3308), *Dilga* (3308), *Eurelia* (3350); in 1921 *Emita* (3350), *Enoggera* (3350), and *Eromanga* (3350). See SHIPPING.

J.H.W.

Shipping. *Under Canvas.*—For some years after its founding New South Wales had no shipping. Vessels which visited Sydney were under contract to the English government to bring out convicts and stores, and (since the country had nothing to export) had to go to China or India for a return cargo. This needed the permission of the East India Company, which had the sole right to trade in Eastern waters. Phillip's instructions forbade any intercourse with other countries, including India and China. This, however, did not prevent those countries from shipping to Sydney cattle and spirits, which found a ready sale; the United States also found a prospective market in New South Wales, for in November 1792 the brigantine *Philadelphia* arrived with a general cargo which was quickly disposed of. Further instructions issued by the colonial office in July 1794 repeated the prohibition of 1787—without much effect, for in April 1799 the governor was instructed to keep proper returns of all ships entering and clearing with cargo. Richard Atkins, a civil magistrate, was appointed registrar of shipping, and was succeeded 12 months later by William Balmain, with the title of 'naval officer' (i.e. collector of customs). A table of fees and assessments was publicly displayed.

In 1790 a flag-signal station was placed on South Head, and a stone platform with a high column was erected as a landmark to indicate the entrance to the harbour.

As no register of shipping was kept for the first 12 years, there is no official record of arrivals and departures, but it is probable that 102 ships, averaging 392 tons each, entered Port Jackson during that time. The first official records, for six months in 1800, are: inwards, 10 vessels averaging 272 tons, outwards, 13 averaging 313 tons. In 1811 a system of pilotage was inaugurated and two pilots and a harbourmaster were appointed. Rates of pilotage were gazetted in 1813, vessels not on the British or East India Company's register having to pay one-fourth more.

The East India Company's monopoly of the Eastern trade was renewed in 1793 for 20 years, but feeling in the shipping world was so strong that in 1807 a bill for freeing trade with New South Wales under licence was drafted; nothing came of this move, but in 1813 the monopoly came automatically to an end. Local owners, however, were still prevented 'from employing ships of less than 350 tons burthen in the trade from the Mother country.' In 1819 a public meeting, presided over by Sir John Jamison, protested against this restriction; few merchants at that time were willing or able to provide cargoes for vessels of such magnitude, and a limit of 150 tons was demanded instead. Why colonists should have been penalized in that manner is not clear; the 23 vessels which arrived in Port Jackson in 1810 from England, India, and America averaged only 230 tons, the largest being the *Ann* (627 tons) and the smallest the *Cyclops* (90 tons) from Calcutta. The protest evidently took effect, for during the next 20 years vessels of all sizes arrived. By this time not only had Australia whale-oil, tallow, and wool for export, but her populated territory was expanding with the colonization of Port Phillip and South Australia in 1835 and 1836.

In 1835 292 vessels reached Sydney from all parts of the world, including 60 from Great Britain and 8 from the United States; the smallest was a brig of 110 tons from Boston in the United States, the largest the *Lady Kennaway* 587 tons), which brought troops from England. The principal shipowners engaged in the Australian trade at this time were Joseph and Frederick Somes of London, who traded as Somes Brothers, and T. and W. Smith, a Tyne firm, who had been Green and Wigram's competitors in the East India trade, and, like them,

had diverted some of their ships to Australia. For nearly 60 years the type of ship used for the Australian trade underwent no change. It was not until the discovery of gold in California in 1847 that Baltimore and Boston shipbuilders produced vessels with much finer lines, known as 'clippers,' to capture the San Francisco trade from the British. Then British shipbuilders and merchants awoke to the fact that these smart ships were taking Great Britain's trade in all parts of the world, and unless they also improved their ships they would lose their trade. Richard Green and Money Wigram and Sons with their Blackwall-built ships, Duncan Dunbar (whose ships of this period were built by Laing of Sunderland), George Thompson with vessels built by Walter Hood of Aberdeen, and other Aberdeen ships from the yards of Alexander Hall, together with James Baines's Black Ball line of Boston-built ships, soon wrought a great change in the Australian trade. The first clipper to come to Australia was the barque *Phoenician* (478 tons) under the White Star flag of George Thompson's line, which arrived in Port Jackson on 21 July 1849; her run was 91 days, a great improvement on the 140 days usual at that period. Thompson entered the Australian trade in 1846, and his firm's sailing-ships traded regularly to Sydney and Melbourne for 60 years. One of its ships, the *Thermopylae*, is credited with making the shortest passage from Start Point to Melbourne —63 days 17 hours. The last sailing-ship under its flag was the *Strathdon*, a steel barque of 2093 tons, built in 1885 and sold in 1905.

Duncan Dunbar's line of Indiamen came into the Australian trade in the 1830s, with the ships *Bussorah Merchant* and *China* (530 tons), and the barques *Duchess of Northumberland* (541), *Earl Grey* (571), and *Morayshire* (316). In the pre-clipper days there were 17 vessels under this flag averaging 644 tons each, of which 12 were built at Sunderland, two on the Tyne, and three in India. Duncan Dunbar was among the first to adopt the clipper, beginning with the *Phoebe Dunbar* in 1850, and following with the *Dunbar* (q.v.) in 1852, the *Duncan Dunbar* in 1857, and the *Dunbar Castle* in 1864. On the death of Duncan Dunbar many of his fleet passed into the hands of Devitt and Moore, who, from this time became one of the chief shipping firms in the Australian trade as long as sailing-ships could cope with it; many of the finest ships that entered Port Jackson were under their house-flag, among them the *Sobraon* (2131 tons) in 1866, followed in the 1870s by the *Hesperus* (1859), *Rodney* (1447), *Macquarie* (1975), *Harbinger* (1585), and *Illawarra* (1963), and in 1884 by the *Derwent* (1970).

The discovery of gold in 1851 brought in new owners to meet the demand for shipping, among them two Blackwall firms—R. and H. Green and Money Wigram and Sons, both builders and owners of many frigate-built ships which traded to India. The Greens built specially for the Australian ports the *Anglesey* (965 tons) and the *Roxburgh Castle* (1049), both in 1852. During the next six years they added the *Agamemnon* (1431), *Walmer Castle* (1065), *Alnwick Castle* (1087), *Windsor Castle* (1074), *Clarence* (1104), and *Lady Melville* (966). In 1860 the *Malabar* (1219) and the *Renown* (1293) were built, and during the next eight years the *Highflyer* (1012), *Shannon* (1292), *Superb* (1451), and *Carlisle Castle* (1458). Money Wigram and Sons, who in pre-clipper days occasionally had a ship in the Sydney trade, made Melbourne their terminal port, placing on the run between 1853 and 1870 the *Kent*, *Sussex*, *Suffolk*, *Norfolk*, *Lincolnshire*, *Yorkshire*, *True Briton*, *Essex*, and *Hampshire*—all superior vessels, built (except the *Hampshire*) at Blackwall, and averaging 1000 tons each.

The gold-rush also brought in Liverpool ships, which were devoted specially to emigrant traffic. James Baines, the founder of the Black Ball line of Australian packets, despatched the first ship under this flag, the *Marco Polo*, on 4 July 1852, with 934 migrants. She reached Melbourne in 78 days, and was followed by the *Lightning* (1468 tons), a 'super-clipper' which on one occasion made a homeward run of 63 days 17½ hours. This vessel was scuttled and sunk when it took fire at Geelong in 1869, and was blown up in 1870.

No fewer than 70 ships of the Black Ball line brought cargo and passengers to the colonies, among them the *James Baines*, *Donald Mackay*, *Sovereign of the Seas*, *Schomberg*, *Champion of the Seas*, *Empress of the Sea*, and *Commodore Perry*.

Another celebrated Liverpool line was the White Star, which in gold-rush days was controlled by Pilkington and Wilson; they put on some of the finest clippers of the day—in 1852 the *Arabian*, in 1853 the *Mermaid*, in 1854 the *Shalimar*, *Blue Jacket*, and *White Star*. This last, the finest of its period, was of 2333 tons, and carried a captain, four deck-officers, a chaplain, surgeon, and purser, and a crew of between 60 and 70. In 1859 34 ships came to Australian ports under the White Star flag, averaging 1250 tons, and carrying 8000 passengers; but they were all American-built softwood vessels, so that their value both in cash and as cargo-carriers rapidly decreased, until in 1867 Pilkington and Wilson sold the fleet, which was dispersed. T. H. Ismay purchased the right to the flag (the well-known swallow-tail with a white star on a red field), and inaugurated a line of iron ships; the *Exporer* (750 tons) reached Melbourne on 24 June 1868, and was followed by the *Houghton* (or *Hoghton*) *Tower* (1598) and the *Victoria Tower* (1563). All the White Star sailing-ships were sold in 1899, the last being the 4-masted steel ship *California* (3099).

In 1869 a Glasgow firm entered the trade with a fleet of iron ships built on the Clyde. This venture developed into the Loch line controlled by Aitken, Lilburn and Company; the 'G.S.Co.' of the house-flag signified both 'Glasgow Shipping Company' and 'General Shipping Company,' both of which were merged in the Loch line. This line had a good deal of ill-fortune. In 1871 the *Loch Leven* was lost on King Island in Bass Strait, the *Loch Ard* about 30 miles west of Cape Otway in 1878, the *Loch Sloy* not far from that locality in 1899, and the *Loch Vennachar* on the South Australian coast in 1905. Notwithstanding these mishaps they were not finally supplanted by steam until 1913.

Few sailing-ships remain on the register. Those that visited Australian ports in 1926 were the 4-masted British barque *William Mitchell* (2035 tons), built in 1892, which entered Port Phillip in January; the barque *Killoran* (1757), built in 1900, which reached Newcastle in February; and the *Garthpool*—formerly the *Juteopolis*—(2852), built in 1891, which left Sydney for Falmouth with wheat on 1 March 1926.

Under Steam.—Steam communication with Europe was initiated by the Peninsular and Ori-

ental Company, which carried the mails between Southampton and eastern Asia. Its mail-steamer *Chusan* was despatched from Southampton on 16 May 1852 and, under steam throughout the voyage, reached Sydney on 3 August via the Cape of Good Hope. During 1852 also arrived the s.s. *Australian* (1500 tons) and the s.s. *Sydney* (1500), both belonging to the Australian Royal Mail Company. In the same year Gibbs, Bright and Company of Liverpool purchased the 6-masted steamer *Great Britain* (3700), which had been stranded in Dundrum Bay, Ireland, got off, and sold at Liverpool; her rig was then altered and she was sent to Australia with 630 passengers, reaching Melbourne on 11 November and Sydney a week or so later. For 30 years she was a frequent visitor to Melbourne. In 1853-5 several steamships of the Australian Royal Mail Company and the General Screw Steamship Company, including the *Croesus, Bosphorus, Queen of the South, Lady Jocelyn,* and *Calcutta,* made Sydney their final port of call; but owing to defects in construction and machinery the venture was a failure. Other steamships made what may be termed experimental voyages, but could not compete with the clippers. The success, however, of the *Great Britain* induced her owners to build in 1855 a companion for her, the *Royal Charter,* which reached Melbourne on 16 April 1856; she made successful voyages until 1859, when she was wrecked in Moelfre Bay on the coast of Wales.

The *Chusan* was followed by the P. and O. Company's *Formosa, Shanghai,* and *Madras,* but in January 1855, owing to the Crimean war, the company's steamers had to be withdrawn from the Australian trade. The Australian service was resumed under a new contract on 12 February 1859, when the *Salsette* left Sydney for Suez; she called at Melbourne, but omitted Adelaide, which was served by a branch steamer from King George's Sound. In 1872 steamers of this line first made use of the Suez Canal; it had been opened in November 1869, but the contract with the British post-office provided for the mails being sent overland, and the postal authorities insisted on this being done.

In 1863 the White Star line, under the control of Pilkington and Wilson of Liverpool, built an auxiliary steamship, the *Royal Standard* (2000 tons), which reached Melbourne on her first voyage in February 1864. She made a few voyages under steam, was then converted to a sailing ship, and, while on a voyage to Melbourne in August 1869, was lost off Cape St. Thorne. In 1899 Ismay, Imrie and Company, representing the then White Star line, disposed of their sailing-ships and contracted with Harland and Wolff of Belfast for five steamers for the Australian trade. The first of these, the *Medic* (11,984 tons, 550 feet long, with a cargo-capacity of 18,797 tons), reached Sydney on 21 September 1899 via the Cape of Good Hope; she called at Adelaide and Melbourne, and was 49 days on the voyage. Since this a continuous service has been maintained by this vessel and the *Afric, Persic, Runic,* and *Suevic*—followed by the *Ceramic* (18,481 tons), which made her first appearance in Port Jackson on 9 September 1913. Devitt and Moore went into steam in 1870 with the *Queen of the Thames,* which reached Melbourne safely, left on the return voyage on 18 February 1871, and was lost near Cape Agulhas while making for Cape Town.

Money Wigram and Sons in 1864 built the *London* (1700 tons), which reached Melbourne on 2 January 1865; on her third outward voyage she was lost in the Bay of Biscay on 11 January 1866. During the next 27 years the *Somersetshire, Northumberland, Durham, Kent,* and others were added, ending with the *Lincolnshire* in 1891; these were all ship-rigged auxiliary steamers. Shortly afterwards the house-flag of this firm—a red cross of St. George on a white ground with a blue square in the centre—was taken over by the Federal Steam Navigation Company.

Many Hamburg ships with German passengers reached Australian ports during and after the gold-rush. On 6 June 1881 the s.s. *Barcelona* (1346 tons), the first of a line from Hamburg owned by R. S. Sloman and Company, reached Sydney, followed in August by the s.s. *Catania* (2198) and many others. In 1886 the Norddeutscher Lloyd (Imperial German Mail) Company inaugurated a monthly line of steamers from Bremen to Sydney via the Suez Canal; the *Lübeck,* a small vessel destined for the island service, arrived on 1 September 1886, followed by the *Salier* (3098), which took 51 days on the passage from Bremen. For 34 years this company maintained a four-weekly passenger-service, its largest vessels being the *Grosser Kurfüst* (13,000 tons) and *Kaiser Wilhelm II.* (19,300). The German-Australian Steamship Company, which came into existence in 1888, catered especially for cargo; its first vessel was the *Elberfeld* (2613 tons), and in 1913 it had in the service 50 vessels, the largest (the *Australia* and *Tasmania*) of 7500 tons.

The French Messageries Maritimes in 1881 built the s.s. *Natal* for the trade between Marseilles and Sydney; since 1882 a continuous service has been maintained, with a branch line to New Caledonia. In recent years larger vessels have been employed—the sister-ships *Ville de Verdun, Ville de Metz,* and *Ville de Strasbourg* (7000 tons), and the *Cephée* (10,000).

In 1874 Anderson, Anderson and Company, who managed a line of sailing-ships (including the *Orient, Coonatta, Murray, Goolwa,* and *Yatala*) trading between England and South Australia chartered the *St. Osyth* (3600 tons) and the *Whampoa* (3800) for Melbourne and Sydney via the Cape—the Suez Canal was at that time not used for Australian-bound steamers except those of the Peninsular and Oriental Company. These vessels, the first of the Orient line, were followed by the *Lusitania, Chimborazo,* and *Cuzco,* chartered from the Pacific Steam Navigation Company. The *Orient* in 1881 was the first of this line to use the canal.

In 1880 Wilhelm Lund, a London shipowner, whose sailing-ships *Mikado, Ambassador,* and *Serapis* traded to China and Australia, built the steamship *Decomyn* (1818 tons) and sent her to Sydney via the Cape; she was the pioneer of the Blue Anchor line, the 19th of which, the *Waratah* (9300 tons), made her first trip in 1908, and on her second return voyage left Durban for Cape Town on 26 July 1909, and was never heard of again. In 1910 this line was purchased by the Peninsular and Oriental Company, and became its branch line via the Cape, all the Blue Anchor vessels being replaced by steamers of 11,000 and 13,000 tons.

The Blue Funnel line came into Australian waters in 1911, the *Aeneas* (10,000 tons) reaching Sydney early in January; her sister-ships *Ascanius* and *Anchises* were also employed on the service, and later the *Nestor* and *Ulysses* (14,500 tons) were added to the fleet. All these

vessels carry passengers via the Cape; a recently added cargo service takes the Suez canal route.

The only Australian-owned line in overseas service is that of the Commonwealth government, whose five passenger steamers, *Esperance Bay, Moreton Bay, Largs Bay, Jervis Bay,* and *Hobson's Bay* (all of 13,850 tons), use the Suez canal route; its cargo steamers, the *Fordsdale* and *Ferndale* (12,500 tons), are the fastest of their kind trading to Europe.

Among other lines carrying cargo between Australia and European ports are the Port line, Clan line, Federal Navigation Company, Scottish Shire line, Swedish and Australian, Norwegian-Australian, Houlder Brothers, Lloyd Sabaudo line, and Navigazione Generale Italiana. Trade with eastern Asia is catered for by the Japanese Nippon Yusen Kaisha (first arrival the *Myke Maru* in February 1891), the Royal Packet Navigation Company (6000-ton steamers between Australian ports and Java), the Eastern and Australian Steamship Company (between Sydney and Hong Kong), and the Australian Oriental line (on the same route). In the Western Australian seas the state government has a service of its own. Communication with the United States is kept up by the Oceanic Steamship Company (San Francisco to Sydney) and the Union Steamship Company (San Francisco and Vancouver to Sydney); the former is an American firm, the latter British. In the Union fleet are the *Aorangi* (22,000 tons, a motor-ship) and the *Niagara* (18,600).

Australian Commonwealth Line.—In view of the limited number of vessels available for the transport of Australian produce overseas during the war of 1914-18, W. M. Hughes (then prime minister) purchased in Great Britain in October 1916, 16 steamers of the 'Strath' line (all of 7180 tons dead-weight capacity), and so inaugurated the Commonwealth Government line; to these were added 18 steamers captured from Germany and Austria at the beginning of the war. Orders were subsequently placed in Britain for 5 steamers to carry both passengers and cargo (each of 13,850 register tons, and now known as the 'Bay' steamers), and in the United States for 4 wooden motor-vessels and 10 wooden steamers; 3 sailing-ships were purchased by the government and handed over to the line. A shipbuilding industry was established in Australia (see SHIPBUILDING), the original programme including 24 steel cargo steamers (each of approximately 6000 dead-weight tonnage) and 24 wooden vessels with auxiliary steam. The order for the wooden vessels was soon cancelled, but 19 of the steel steamers have been completed. Later, two large cargo steamers (the *Fordsdale* and *Ferndale,* each of 12,500 tons dead-weight capacity) were built. During the war two of the 'Strath' steamers (the *Australdale* and *Australbank*) and two ex-enemy vessels were lost by enemy action, and one ex-enemy steamer and one sailing-vessel were wrecked. In 1923 the government appointed a board to control its 54 steamers and altered the name of the line to the 'Australian Commonwealth Line of Steamers.' Much of the old and unsuitable tonnage has since been disposed of; the present fleet consists of the five 'Bay,' the two 12,000 tons cargo steamers, and three ex-enemy vessels of 8300, 8550, and 10,550 dead weight tons. A regular passenger and cargo service is maintained between Australian ports and the United Kingdom. At present (1926) there are out of commission one ex-enemy and five Australian-built steamers.

Coastal and Interstate. New South Wales.—Coastal trade developed first with the Hawkesbury and then with the settlement on the Hunter River. The first official record notes the arrival at Sydney of the *Anna Josepha* (170 tons) from the Hunter River with coal and cedar for Simeon Lord on 29 May 1801. Before 1800, as has been already stated, no official records were kept. Communication with the coastal settlements, both north and south, was for many years maintained by small sailing-craft. The first steam-vessel in the coastal service was a small paddle-wheel boat—the *Sophia Jane*—which reached Port Jackson from England under canvas on 15 May 1831. She was put into the Hunter River trade, and made her first Sydney-Newcastle trip in 8 hours on 13 June; thenceforward she ran regularly until 1846, when she was broken up. The next steamer, the *William the Fourth,* was built on the Williams River and launched on 22 October 1831; she also was placed in the Hunter River trade, and made her first trip in February 1832. The *James Watt,* an English-built steamer which reached Sydney on 18 February 1837, made in July the pioneer steam-voyage to Port Phillip, and later in the year the pioneer steam-voyage to Brisbane.

In 1839 the newly founded Hunter River Steam Navigation Company sent to England for three steamers, the *Rose, Shamrock,* and *Thistle.* The first of these to arrive was the *Shamrock,* which reached Sydney on 15 October 1841, and was employed in the intercolonial trade (between Sydney, Melbourne, and Launceston) for 16 years. In 1842 the company purchased a locally built steamer, the *Sovereign,* and placed her in the northern trade (Port Macquarie, the Manning, and Brisbane); she was lost in Moreton Bay on 17 March 1847.

Two steamers which came from England under the auspices of Benjamin Boyd were placed in the intercolonial trade in 1842, the *Seahorse* (which had reached Sydney on 4 July 1841) running to Melbourne and Launceston, and the *Cornubia* to northern ports. Both were unsuccessful.

In 1851 the Hunter River Company changed its name (becoming the Australasian Steam Navigation Company), and had the *City of Sydney* and *Wonga Wonga* built at Glasgow for the Melbourne trade, the *Brisbane* and *Boomerang* for the Brisbane run, and the *Illalong* for the Hunter River. These vessels served for many years, especially the *Wonga Wonga* and the *City of Sydney*; the latter was lost on Green Cape on 6 November 1862. Meanwhile the Hunter River merchants, feeling that the new company had grown too big to serve their interests, formed in 1854 the Hunter River New Steam Navigation Company, and ordered three steamers from Scotland—the *Hunter, Williams,* and *Paterson.*

In 1854, too, the Sydney and Melbourne Steam Packet Company was formed, opening its service with an American beam-engine steamer, the *New Orleans*—which was sent to Australia from San Francisco for sale—and the *Hellespont* and *London,* which had been sent out from England for the same purpose. A larger vessel, the paddle-wheel steamer *Pacific* (985 tons), was built in England and reached Sydney on 26 February 1855; she was 93 days on the passage, and proved so unsuitable that she was sent back to be sold; the other steamers were then disposed of to the A.S.N.Co. and

the Sydney and Melbourne Company was wound up. The South Coast trade had been occasionally catered for by any steamer that could not find profitable employment elsewhere—among them the *Sophia Jane*, the *William the Fourth*, and the *Maitland*—until 1852, when there arrived from England a small screw-steamer, the *Keira*, which had been built specially for the Wollongong trade and given a local name. She did not pay, however, was sold to Cowie of Geelong, and ran between that town and Melbourne. The *Illawarra* and *Kiama*, built in England in 1854 for this trade, were owned by the Illawarra Steam Navigation Company.

The North Coast ports of New South Wales (particularly those on the Clarence, Richmond, and Tweed rivers) are served by the North Coast Steam Navigation Company, which came into existence in 1891. Its vessels are of 1000-2000 tons burthen, their size being limited by the fact that the greater part of their trade is done with ports blocked by bars (see HARBOURS). Vessels of lighter draught belonging to the Allen Taylor and the Cain lines serve ports on the smaller rivers.

Victoria.—In 1851 William Howard Smith brought out from England the screw-steamer *Express* and ran her between Geelong and Melbourne; in 1862 he purchased the s.s. *Kief*, renamed her *You-Yangs*, and brought her out to Launceston early in 1864, for trading between Melbourne and Sydney. Thus was laid the foundation of the business controlled by Howard Smith Limited (now Australian Steamships Limited), whose fleet includes the *Canberra* (7700 tons). Other important interstate lines are the Huddart Parker line, McIlwraith McEacharn Limited, the Melbourne Steamship Company, and the Adelaide Steamship Company.

The first of the interstate companies, the A.S.N.Co., in 1868 bought out the Queensland Steam Navigation Company, which had been formed in 1861; in 1883 the Queensland Steam Ship Company became a strong competitor, and in 1908 bought out the A.S.N.Co., the combined fleets being placed under a new flag, that of the Australasian United Steam Navigation Company. Interstate steamers are now (1926) controlled, so far as concerns sailings, fares, and freights, by an Australasian Steamship Owners' Federation.

Trade with New Zealand, which commenced with small missionary vessels and whalers in the early years of the last century, became of commercial interest when Auckland was founded in 1840, and a large trade was carried on between Sydney and New Zealand ports by schooners and brigs. In the 1850s the *William Denny*, *Prince Alfred*, *Lord Worsley*, and other steamers were employed in this service. In 1859 McMeckan and Blackwood of Melbourne placed some steamers on the line; by 1879 they had developed into a powerful company which was bought out by the Union Steamship Company of New Zealand.

The Pacific island trade is principally controlled by Burns, Philp and Company; this business, founded in 1877 by James Burns (see BURNS, SIR JAMES and PHILP, SIR ROBERT), was in 1883 formed into a company which trades with all the western Pacific islands, Malaysia, and ports of eastern Asia. See MANDATED TERRITORY.

Tasmania is kept in touch with Melbourne by steamer from Launceston three times a week, owned by the Tasmanian Steamers Proprietary; Sydney is connected with Hobart by the steamers of the Union Steamship Company and the Huddart Parker line.

Motor-ships.—The first full-powered vessel propelled by Diesel engines was the *Annam* (5295 tons) from Copenhagen, which reached Fremantle in December 1914. The largest of the type now trading to Australia is the *Aorangi*, owned by the Union Steamship Company of New Zealand, which arrived from England via the Panama canal early in 1925 and runs between Vancouver and Sydney. The Burns Philp, British India, Commonwealth and Dominion, and Adelaide Steamship lines also employ motor-vessels.

J.H.W.

Ship-worm. See MOLLUSCA.

Short, AUGUSTUS (1802-1883), born on 11 June 1802 and educated at Westminster school and at Christ Church College, Oxford (B.A., 1824; M.A., 1826; D.D., 1847), was ordained deacon in 1826 (priest, 1827) and was licensed to the curacy of Culham in Oxfordshire. In 1829 he became tutor and lecturer at Christ Church, and in 1833 librarian and censor. In 1835 he was appointed vicar of Ravensthorpe in Northamptonshire, and was select preacher at the university of Oxford in 1843. He sympathized with the 'tractarian' movement, and wrote a defence of Tract XC, but disapproved of W. G. Ward's *Ideal of a Christian Church*. In 1846 he delivered the Bampton lectures. When in 1847 the dioceses of Cape Town, Melbourne, Adelaide, and Newcastle were constituted, he was offered his choice of Adelaide or Newcastle, chose Adelaide, and was consecrated on 29 June (see CHURCH OF ENGLAND). On his arrival in South Australia he found five clergy only, and in 1851 his difficulties were increased by the withdrawal of public moneys previously voted for the maintenance of public worship. He then set himself to create a voluntary organization, belonging to the Church of England but having its own constitution, which should provide the funds needed to administer his diocese. He was a capable administrator, did his best to meet the needs of the scattered bush communities, was keenly interested in work among the aborigines, accomplished much for the organization of education (founding St. Peter's College), and was instrumental in building the Adelaide cathedral. Further, he took an active interest in the university, of which he was vice-chancellor in 1872 and chancellor in 1876. In 1878 he attended the Lambeth conference. He retired in November 1881, settled in London, and died at Eastbourne on 5 October 1883.

J.V.C.-B.

Shortland, JOHN (1736-1803), born near Plymouth in 1736, was the first of a remarkable West of England family, six members of which had a share in securing for Britain her colonies in Australia and New Zealand. He served as a midshipman under Boscawen in 1755, under Byng in 1756, and under Rodney in 1761; was promoted lieutenant and assigned to the transport service in 1763; took reinforcements into Gibraltar during the siege of 1782, and in 1786 was made naval agent with the 'First Fleet' (q.v.). He sailed in the *Alexander*, reached Botany Bay on 19 January 1788, and on his way back to England via Batavia discovered and charted many islands and reefs, including the dangerous Middleton Shoal in the Tasman Sea. Returning to London, he strongly urged the admiralty to have the

eastern coast of Australia thoroughly surveyed and charted, and was thus partly responsible for the despatch of Matthew Flinders in 1799. He died at Lille in France in 1803.—His eldest son, also John Shortland, is separately dealt with. His second son, THOMAS GEORGE SHORTLAND (1771-1827), born at Portsea on 10 May 1771, joined the navy in 1785, and in 1787 was appointed to the *Alexander* under his father. His visit to New South Wales on that voyage was his only connection with Australia. His naval record (lieutenant, 1790; commander, 1799; post-captain, 1802) was brilliant, including much fighting between 1793 and 1799, and the leadership of the van when Duckworth forced the passage of the Dardanelles in 1807. In 1813 he retired from active service, and was successively agent for prisoners-of-war at Dartmoor (1813-16), commandant at the Hamoaze, Plymouth (1816-19), and comptroller-general of the preventive boat-service (1819-22). On 14 July 1825 he was made commandant at Jamaica, and died there of yellow fever towards the end of 1827.—Three of T. G. Shortland's sons served in Australasian waters. WILLOUGHBY SHORTLAND (1804-1869) entered the navy in 1818, and in 1839 accompanied William Hobson to New Zealand, where after Hobson's death he administered the government until the arrival of Governor FitzRoy. He was then appointed to the Leeward Islands in the West Indies, being governor of Nevis in 1845-53 and of Tobago in 1854-6; he returned to England in 1856, and died at Kingsbridge in Devon on 7 October 1869.—EDWARD SHORTLAND (1812-1893) was Hobson's private secretary in New Zealand, and in 1842 was made protector of aborigines. After a visit to England in 1860 he settled at Parnell (near Auckland) as a physician, but returned to England in 1889 and died at Plymouth on 5 July 1893. He wrote much about the Maoris, his chief works being *The Southern Districts of New Zea'and* (1851), *Traditions and Superstitions of the New Zealanders* (1854), and *Maori Re igion and Mythology* (1882).—PETER FREDERICK SHORTLAND (1815-1888) entered the naval college at Portsmouth in 1827, joined the navy (lieutenant, 1834; commander, 1848; captain, 1859; rear-admiral, 1876; vice-admiral, 1881), and in 1836-8 served aboard H.M.S. *Rattlesnake* in Australian waters. He was active in the survey of Port Phillip, and the headland now known as Queenscliff was called after him Shortland's Bluff. In 1838-42 he was on leave of absence studying at Pembroke College, Cambridge; graduating as seventh wrangler, he was at once appointed to survey the coast of Nova Scotia, a task which occupied him till 1865; he then took command of H.M.S. *Hydra* for survey work in the Mediterranean, and in 1867-8 charted a line of soundings from Aden to Bombay. In 1870 he went on the retired list, studied for the bar, and was called at Lincoln's Inn on 27 January 1873. He died at Plymouth on 18 October 1888. He wrote *A Sounding Voyage of H.M.S. 'Hydra'* (1868), *A Short Account of the Laws Which Govern Her Majesty's Navy* (1886), and *Nautical Surveying* (posthumously published in 1890).

W.J.

Shortland, JOHN (1769-1810), son of John Shortland mentioned above, was born on 5 September 1769 and joined the navy in 1781 as a midshipman in a transport commanded by his father (lieutenant, 1792; commander, 1800; post-captain, 1805). In 1783-7 he served in H.M.S. *Latona* on the West Indian station, and in 1787 at his father's request was made master's mate aboard H.M.S. *Sirius* (q.v.). Hunter took the lad with him when he returned to England in 1792, and when he came out as governor in 1795 made Shortland first lieutenant in H.M.S. *Re iance*. In that capacity he was too much occupied with his ship to share the exploring adventures of his younger shipmates Bass and Flinders; but in August 1797 Hunter despatched him northwards along the coast in chase of some runaway convicts, and while returning he discovered the estuary of the Hunter River on 9 September. To him, however, this was but a slight consolation for missing five years of the naval war in Europe. In 1800 the *Reliance* returned to England, and Shortland was appointed to the *Pandour* frigate as agent for Abercrombie's troops then going to Egypt. While lying off Alexandria in 1803, he landed a party with whose help he flew a kite over Pompey's Pillar (a notable obelisk), hauled over it a rope and then a rope-ladder, and on 2 February climbed 160 feet to the top to drink the King's health; on the 6th he repeated the exploit, ate a beefsteak there, and fixed a weathervane atop. His most famous deed was his fight in the *Junon* with four French frigates. The *Junon* was herself a French 40-gun frigate which had been captured in February 1809 near Halifax in Nova Scotia, and Shortland, when given command of her, spent £1500 of his own money in fitting her out. In September he was sent on a cruise, and on 13 December sighted four ships which by their colours and their private signals seemed to be Spanish. Shortland, thus enticed within gunshot, found himself engaged—with a crew of 200, 100 men short—against ships mounting altogether 120 guns and carrying 1400 men. In a fight that lasted 75 minutes half his men were killed and he himself very severely wounded, his head being the only part uninjured; the *Junon* was so damaged that she had to be burnt next morning. Shortland was carried by the French to Guadeloupe, where he died in the military hospital on 21 January, 1810. He was buried with military honours at Basseterre.

W.J.

Shot-hole Borers. See WOOD-BORERS.

Shoveller. See DUCKS AND GEESE.

Shovel-nosed Rays, members of the family Rhinobatidae, also known as guitar-fishes, are characterized by having the snout produced into a broad triangular and flattened projection, and the tails strong and very similar to those of sharks. They are plentiful both in temperate and in tropical seas. Some are beautifully marked, and one, the White-spotted Shovel-nose (*Rhynchobatus djiddensis*) attains a length of seven feet. The Fiddler (*Trygonorrhina fasciata*), a common southern member of the family, is beautifully ornamented with symmetrical curved markings that somewhat resemble those on the body of a fiddle; it attains a length of four feet, and its young, like those of all other members of the family, are born alive.

A.R.McC.

Shrike-thrushes, perching-birds belonging to the genus *Colluricincla*, peculiar to the Australian region. This genus has by various authors been allotted to the families Campephagidae (cuckoo-shrikes), Laniidae (shrikes), and Prionopidae (wood-shrikes), and it is not im-

possible that it really belongs to the Pachycephalidae (thickheads).

Shrike-thrushes are gray or brown birds, sometimes with some buff or rufous colour on the underparts, frequenting forest or scrub-covered country and feeding on insects, which they obtain among the branches or by tearing away loose pieces of bark. They are pleasing songsters, uttering rich, loud, clear notes. Their nests are cup-shaped, built of strips of bark, lined with roots and grasses, and placed on the top of a stump in a tree, or, occasionally, on a rock, or in a cavity in a creek-bank. They lay three or four eggs, white, with spots of bluish-gray and blotches of chestnut-brown.

Gray Shrike-thrush (*length* 9½ *in.*).

The most familiar species is the Harmonious or Gray Thrush (*C. harmonica*) of eastern Australia and Tasmania, commonly called 'Whistling Dick' in the island State. In Western Australia and the western part of South Australia the very similar Buff-bellied Thrush (*C. rufiventris*) takes its place. Several other species occur in northern Australia and New Guinea.

W.B.A.

Shrike-tit. See THICKHEADS.

Sickle-fern. See FERNS.

Sida, a large genus of the family Malvaceae, consisting of herbs or shrubs with soft starry hairs and yellow or white flowers. It is widespread over warm regions, but most abundant in America; 26 species are indigenous to Australia. *S. rhombifolia* (Queensland Hemp, Paddy's Lucerne) is a harsh shrub with small yellow flowers; the leaves are mucilaginous, and cattle devour the stems greedily, and are often injured because of their fibrous nature. The ripe fruits are injurious to fowls, since the sharp points of the carpels cause inflammation when swallowed. The toughness of this species is so marked that it is difficult to eradicate; it is one of the most formidable weed-pests in the warmer parts of Australia to-day, and is yearly becoming acclimatized in fresh localities. It yields a useful fibre, but the production of it in Australia is not profitable.

Sideroxylon, a widely dispersed genus of the family Sapotaceae, chiefly tropical, with 13 species indigenous to Australia. *S. australe* (Black Apple, the 'wycaulie' of the Richmond River natives) is a tree reaching 100 feet in height, with a milky sap which when fresh tastes like cream—its effect on the human system, however, has not been ascertained. The fruit resembles a large plum, but is rather insipid. It has pale-yellow timber, with a prettily patterned grain. The bark of *S. Richardi* has a sweet taste, but is somewhat astringent. *S. myrsinoides* and *S. Pohlmanianum* yield useful timbers.

Silicates. See MINERALOGY.

Silky Oak, the popular name of *Grevillea robusta,* which extends from the brushes of the Clarence River in New South Wales up to northern Queensland. It is a handsome tree (60-80 feet) with deeply divided fern-like leaves and a profusion of orange-yellow flowers in elongated, flattened spikes. The flowers are rich in honey; the seeds are surrounded by a broad wing, and are thus dispersed by the wind. The timber is highly ornamental, and much in demand for

Grevillea robusta.

furniture and for house-interiors. The tree is extensively cultivated for park and street planting not only in Australia, but in other parts of the world. In Victoria it is largely used as a pot-plant, its fern-like foliage rendering it highly decorative; in warmer climates it grows too rapidly for that purpose. Other proteaceae plants (especially *Orites excelsa*) are known in particular localities as silky oak, but *G. robusta* is the original owner of the name. See GREVILLEA.

Silver and Lead. The ores of these metals are so intermingled that it has become the custom to class them together, and to write even in official publications as if they occurred as a silver-lead alloy. For convenience' sake facts concerning the two metals are here grouped together. *New South Wales.*—The first report of the existence of silver in Australia occurs in a letter written by Count Strzelecki towards the end of 1839, but only small quantities of ore were discovered until in 1882 Charles Rasp found the still unsurpassed deposits at Broken Hill (q.v.) in western New South Wales. In that colony a few fields were already being worked —Borah Creek near Inverell since 1870, Sunny Corner near Rydal since 1875, Boorook near Tenterfield since 1878; but Broken Hill at once out-distanced them all. The next most important field in New South Wales is at Yerranderie in the hills behind Picton, where in 1925 1211 tons of ore yielded 111,532 oz. of silver, 217 oz. gold, and 317 tons lead. One stope in the Silver Peaks mine on this field showed over 10 ft. of solid galena, yielding in 1923 120 oz. silver and 33 per cent of lead per ton. A mine at Kangiara near Yass obtained from 146 tons of ore 2575 oz. silver and 37 tons lead, besides 11 oz. gold. Condobolin in the west, Tumbar-

umba in the south, and Tenterfield and Emmaville in the north are also silver-producing localities. Some very rich silver ore only has been mined at Rockvale in the neighbourhood of Armidale.

All native gold contains a varying percentage of silver, and in *Victoria* that is the only form in which silver is obtained—as a by-product in the process of minting. In *Queensland* the mining of silver-lead ores began with the discovery of the Ravenswood field in 1879. At Chillagoe in 1884 32 lead-shows were being worked, and during 1885-95 over one and a half million ounces were raised at the Mount Albion mine. The chief yields in 1925 were:—Chillagoe, silver £10,432, lead £60,785; Herberton, silver £9370, lead £15,162; Mount Morgan, silver £2577 (recovered from the gold); Etheridge, silver £2435, lead £11,896. Some of the mining leases at Chillagoe are owned by the State. In 1923 a new silver-lead field was discovered at Mount Isa in the Cloncurry district; the lodes are distributed over an area five miles long by one wide along the western bank of the West Leichhardt River. Large accumulations of high-grade carbonate of lead are in sight on this field, which is the most important find since Broken Hill. Complex silver-lead ore also occurs at Silver Spur. In *South Australia* little silver is produced, though silver-lead ores are found in the main range, and the Wheal Gawler mine, near Glen Osmond, opened in 1841, was probably the first mine worked in the Commonwealth. Rich ore has been discovered at Miltalie and Poonana in the Franklin Harbour district, at Mount Malvern and Olivaster near Rapid Bay, in the vicinity of Blinman and Farina, and at Eukaby near Baratta. In 1923 ores were found between Ooloo dam and Mount Distance, north of the Flinders Range, but no mining has been done. In *Western Australia* 81,226 oz. of silver were obtained as a by-product in 1925, and 4854 tons of lead and silver-lead ore valued at £83,095 were exported. The Northampton mineral field yielded 37,865 tons of lead. *Tasmania* in 1924 produced 494,782 oz. of silver and 4559 tons of lead. Of the silver, the Magnet mines returned 151,084 oz., North Mount Farrell 194,702, Zeehan mines 41,464, Mount Lyell 147,376, and Round Hill 24,169; the principal producers of lead were North Mount Farrell (1933 tons), Zeehan (500), and Magnet (900). In the *Northern Territory* silver-lead ores are found near Pine Creek, Lawn Hill, and at Mount Shoebridge, but owing to the cost of transport little attention has been given to them.

The value of the production of silver, silver-lead, and ore from each State for the seven years ending 1925 was:—

Years.	N.S.W.	Vic.	Q.	S.A.	W.A.	Tas.	N.T.	Australia.
	£	£	£	£	£	£	£	£
1919	1,647,878	1,607	28,511	180	107,508	136,234	(a) 132	1,922,050
1920	123,481	1,714	135,559	2,646	190,484	309,035	(a) 299	763,218
1921	1,327,364	862	54,188	240	67,521	89,817	...	1,539,992
1922	2,574,108	1,080	109,350	377	87,692	241,694	...	3,014,301
1923	2,956,862	963	216,645	60	60,061	218,881	...	3,453,472
1924	4,310,360	645	167,469	373	96,504	252,718	...	4,828,069
1925	5,320,976	291	240,684	1,655	114,960	302,961	617	5,982,144

(a) Year ended 30th June.

For map showing principal deposits see under ZINC.

Silverbelly, a small fish (*Xystaema ovatum*), attaining a length of 10 inches, not uncommon in inlets along the coast of the southern half of Australia. Its colouring is a bright silver, the upper portions being tinged with darker colours, and its scales are very deciduous. A number of allied species occur on tropical coasts, and several were secured in plenty by the trawler *Endeavour* in Queensland waters; all are of small size, but their delicate flesh makes them choice table-fishes. A remarkable feature of the family is the greatly protractile mouth.

A.R.McC.

Silver Bream. See TREVALLY.

Silver-eyes (or White-eyes), small perching birds of the genus *Zosterops* and family Zosteropidae, which occur throughout Africa, southern Asia, the Malay Archipelago, and the Pacific islands as far east as Fiji. Five species have been found in Australia. They are greenish or yellowish above and whitish below, with a ring of small white feathers round the eye: sprightly little birds, generally met with in small parties in bushes or trees, diligently searching for small insects and berries. They do a great amount of good by destroying aphides, scale-insects, and other pests, and have thereby earned the name of blight-birds; but they are also fond of fruit, and invade vineyards and orchards in numbers when the fruit is ripe, causing great destruction among grapes, apricots, and other soft fruits.

When feeding they constantly call to one another, uttering a clear penetrating note. They also have a very pretty song, pitched low, which is only audible for a short distance. Their nests are round, deep, cup-shaped, and extremely light, fastened by the rims to slender branches, and swinging clear like hammocks; composed of grass, moss, or wool, neatly lined

Silver-eye (*length* 4½ *in.*).

with fine grass or fibrous rootlets. The silver-eye lays three pale-blue eggs. The common Silver-eye (*Z. lateralis*), of south-eastern Australia and Tasmania, is very plentiful and familiar in the coastal districts. It is of interest because it has colonized New Zealand, quite independently of human assistance, since the white settlement of that country. The exact date of its arrival in the South Island is not known, but in 1856 it first appeared in the North Island, and the Maoris bestowed on it the name of 'tauhou' (stranger); since then it has become one of the commonest birds throughout New Zealand, and has spread to the Chatham Islands.

In south-western Australia the Green-backed Silver-eye, *Z. australasiae* (generally known as

the 'greenie'), is very abundant, while all round the north coast of the continent occurs the Yellow Silver-eye (*Z. lutea*). The two remaining species also occur in the north.

W.B.A.

Silverfish. See THYSANURA.

Silver Perch. a freshwater species (*Therapon bidyana*) which occurs in large numbers in the Murray and Darling river-system, and is also recorded from several Western Australian rivers. It inhabits clear running streams, often feeding in small schools in the vicinity of eddies, and breaking the surface like trout in quest of flies and other insects. It reaches a length of two feet, affords fine sport to anglers, and is a good food-fish. It is sometimes known as 'grunter,' on account of the snorting sound which it makes when captured.

A.R.McC.

Sinclair-Maclagan, EWEN GEORGE, born at Edinburgh on 24 December 1868, entered the British army in 1889 (2nd lieutenant, 1889; lieutenant, 1892; captain, 1898; major, 1908; lieutenant-colonel, 1914; colonel, 1914; brigadier-general, 1914; major-general, 1917). Having served in Australia immediately after the South African war (q.v.), and returned as director of drill in the newly founded military college at Duntroon, he was in 1914 appointed to command the 3rd infantry brigade of the 1st division, Australian Imperial Force. His brigade (largely composed of miners and therefore of peculiar hardiness) was considered to be especially well trained, and was chosen as the covering force for the landing, on 25 April 1915, near Gaba Tepe in Gallipoli. Sinclair-Maclagan, who was at an early stage ashore with his troops, recognized at once that the objective was too extensive, and held his battalions as far as possible on the second ridge, which remained thenceforward the main Anzac position. He accompanied his brigade to France (where it fought under him at Pozières in the first battle of the Somme), and succeeded General Holmes in the command of the 4th division, which he retained until the end of the war. See AUSTRALIAN IMPERIAL FORCE. (D.S.O., 1900; C.B., 1917; C.M.G., 1919.)

C.E.W.B.

Sirius, H.M.S., the guardship to the First Fleet (q.v.), was built for the East India trade in 1780, named *Berwick*, purchased by the admiralty in 1781 for use as a storeship, and rated as a sixth-rate. After two voyages to the West Indies she was laid up, but was recommissioned under Phillip in 1787 and renamed *Sirius*. Her upper works, which had been destroyed by fire, were repaired, and an upper (spar) deck was laid between the fore and main masts over her original main deck, which thus became the gun-deck. She was, therefore, practically flush-decked fore and aft, with a stout rail running completely round the upper deck on which she carried her four boats; her guns, being on the old main deck, were carried somewhat higher, relatively, than they would have been had she been built in the first place with a gun-deck. Her tonnage is usually stated as 612 tons, sometimes as 520; probably the latter tonnage was that of the *Berwick* before the additional carrying-space was obtained by laying the upper deck. She was armed with 4 six-pounders and 6 carronades. At Phillip's request 10 more guns with ironwork for their carriages were placed aboard, so that she is usually said to have carried 20 guns; but the second 10 were stowed away in the hold, and only hoisted out in Sydney to be placed in a fort erected in 1788 on the east side of Sydney Cove. Her gun-deck was also utilized for carrying stores, so that, when she reached Santa Cruz on the outward voyage, Phillip apologized for being unable to fire a salute to the fort as his guns were too much hampered with stores.

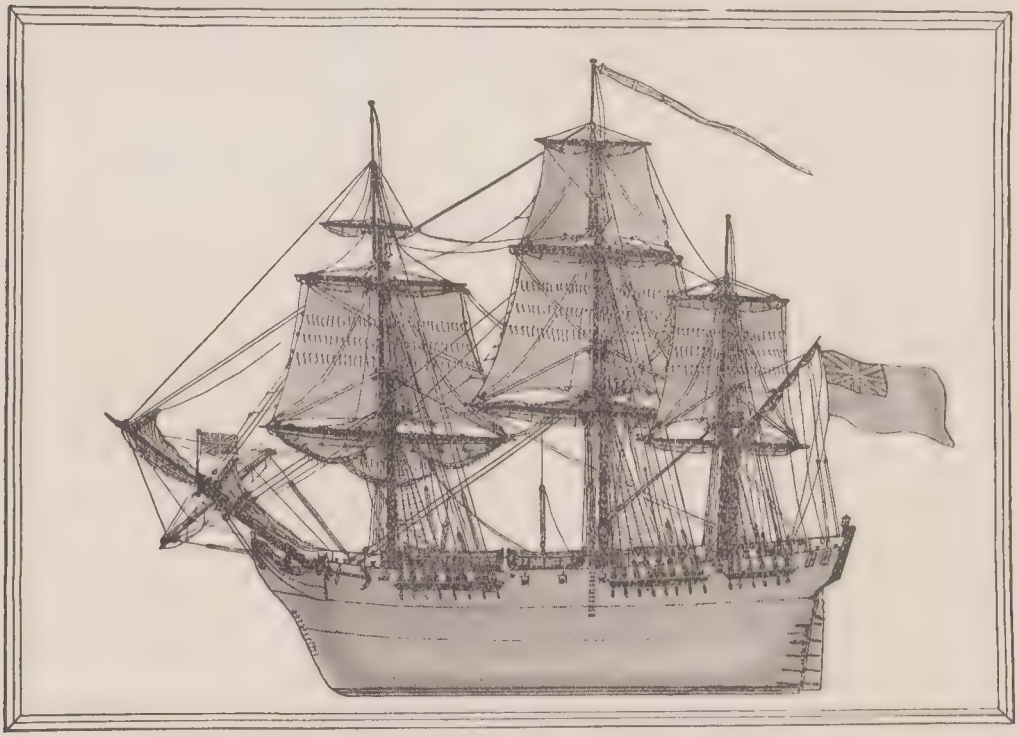
At Cape Town 8 guns were removed from the gun-deck and stowed in the lower hold, to make room for stalls for cattle; these were constructed on the gun-deck, leaving only sufficient room forward to work the cables. On her arrival in Sydney, therefore, she had only 2 guns mounted in position. The 8 guns were put back in February 1788, but a few months later were landed and placed in a fort at Dawes Point. Her hull was well built of teak, but the repaired upper works and deck gave considerable trouble and inconvenience through leaking; the bottom was sheathed with copper; the hull was painted bright yellow, with a broad black band near the water-line. Her extreme length from figure-head to right aft was about 132 feet; inside length of keel (for measurement of tonnage), 100 feet; breadth, 32 feet; depth from keel to upper deck, 26 feet; loaded draft, 17 feet; height of main mast above the deck, 122 feet. Her best speed in a favourable breeze was about 7 knots.

Her rig was the usual rig for vessels of her class, three square sails on the fore and three on the main mast—foresail and mainsail, topsails and top-gallant sails; on the mizen-mast only one square sail, a topsail. She did not carry royals, the long spare pole at the head of each mast being merely a flagpole, not strong enough to carry a sail. No royal sails or yards were supplied. She also carried one jib, the usual staysails, and a mizen or driver or spanker. She sailed under the red ensign, as did all ships of the navy when unattached to squadrons commanded by flag officers of the white or the blue. Phillip when aboard flew a commodore's broad pennant at the main; when Hunter was in sole command, he flew the usual very long pennant instead. Her three lieutenants were W. Bradley, P. G. King (q.v.), and G. W. Maxwell, and her complement 160 men all told. John Hunter was appointed second captain by the admiralty, so that when Phillip was not aboard there should still be a post-captain in command.

The *Sirius* with the First Fleet sailed from the Motherbank (Spithead) on 13 May 1787, visited Santa Cruz, Rio de Janeiro, and Cape Town, arrived in Botany Bay on 20 January 1788, and reached Port Jackson on 26 January. She remained in Port Jackson until 2 October 1788, when she sailed for Cape Town to obtain provisions. She proceeded south of New Zealand, then eastwards past Cape Horn, thence to Cape Town, and was thus the pioneer of this route, so well known in later years to 'homeward-bounders.' Leaving Table Bay on 20 January 1789, she continued her voyage eastwards to Port Jackson, where she arrived on 8 May, having sailed completely round the world in the belt of westerly winds known as the 'roaring forties.' While off the south end of Tasmania on 22 April during very heavy weather her figure-head was washed away, and she was badly damaged forward. She then remained in Port Jackson until 7 March 1790, when she left for Norfolk Island to land mar-

ines, convicts, and stores. She reached the island on 13 March, landing her passengers on that and the following day. Heavy weather then kept her at sea for four days, but on the 18th it moderated and Hunter hove to off Sydney Bay, on the south side of the island, to land provisions. While loading the boats the ship drifted too far into the bay and was unable to beat out again, as she made too much leeway and sternway; she was then driven on to the shore reef in front of the settlement, and in a few minutes became a total wreck. By means of a hawser to the shore with a traveller on it, all the crew got safely ashore through heavy surf, and in the next few weeks a good deal of stores and provisions were saved. It was 11 months before Hunter and most of his crew could return to Sydney; they arrived there on 26 February 1791, and in April 1792 reached England, where a court martial honourably acquitted Hunter and his officers of all blame for loss of the ship.

The only authentic pictures or sketches of the *Sirius* are contained in Lieutenant Bradley's journal, now in the Mitchell Library at Sydney; a larger picture of the wreck, which is in the British Museum, is also probably by Bradley. From these water-colour sketches the dimensional sketch accompanying this article has been drawn, the dimensions all having been cal-



Dimensional sketch of H.M.S. *Sirius*, showing sails carried on arrival in Port Jackson, 26 January 1788.

culated by contemporary rules used in H.M. dockyards; the rigging is of the same period as shown in their technical works on seamanship.

For a hundred years the position of the *Sirius* wreck was shown on the admiralty plan of Norfolk Island; near this position could be seen an anchor which tradition, probably correctly, allotted to her. In 1906 this anchor was raised and sent to Sydney, where it was placed on a pedestal erected in Macquarie-place. The palms (ends) of the flukes were broken off in the process of recovering the anchor, and of course the wooden stock and hempen cable had perished long before. F.J.B.

Skates, also known as thorn-back rays (Rajidae), are chiefly inhabitants of temperate waters, though a few occur in the deeper waters of tropical seas. They are usually armed with more or less numerous spines on the back, and males often have rows of sharp spiny hooks near the margins of the pectoral fins. The teeth differ in the two sexes, those of the male being produced into sharp cusps, whereas in the female they are flattened and obtuse. The young are produced from eggs, which are deposited in horny cases, oblong in shape, and ranging in length from a little over an inch to eight inches. Skates are largely used as food in the northern hemisphere, the pectoral fins or 'wings' having a distinctive and palatable flavour and a gelatinous consistency. A small species, *Raja australis*, is captured fairly plentifully by trawlers in deeper water off the south-eastern coasts of Australia, but it is less prized as food than the sting-rays (q.v.), which are commonly sold in the markets as 'skate.' Another and larger species, *R. nasuta*, attaining a width across the disk of nearly four feet, is common in Bass Strait, and will probably prove a valuable food-fish. A number of other species are known from Australian waters, some ornamented with beautiful colours and markings. A.R.McC.

Skipjack. See TAILOR and TREVALLY.

Skirving, WILLIAM. See MUIR, THOMAS and PALMER, T. F.

Skittle-dogs. See DOG-FISHES.

Skuas. See GULLS, TERNS, AND SKUAS.

Sky-stones. See METEORITES.

Sladen, SIR CHARLES (1816-1884), born at Ripple Park in Kent in 1816 and educated at Shrewsbury school and Trinity Hall, Cambridge (B.A., 1837; LL.B., 1840; LL.D., 1867), migrated to the Port Phillip settlement in 1842 and settled at Geelong as a solicitor. Retiring from practice in 1854, he was on 28 November 1855 made treasurer in the Haines ministry, the first under responsible government. In November 1856 he was elected to represent Geelong in the first legislative assembly, but when Haines was defeated in March 1857 Sladen temporarily abandoned politics. In 1864 he was elected to the legislative council, and in 1865 led the opposition to McCulloch's attempts to 'tack' tariff legislation to an appropriation bill (see DARLING, SIR CHARLES). Three years later, when McCulloch's quarrel with the council threatened to involve a second governor and create a dangerous crisis, Sladen sacrificed himself by undertaking to form a ministry without a majority in the assembly. For nine weeks he held office without power, the assembly even refusing him supplies; but during those weeks the cause of the quarrel disappeared, and Sladen retired with honour from both the premiership and the council. He had while premier introduced a bill widening the council franchise, which was passed by his successor. He never again held office, but in 1876 was returned to the council by the Western Province, and in 1878 took an active part in the negotiations with Sir Graham Berry over council reform. He fought Berry also over proposals for a land tax and for payment of members. In December 1882 he finally retired, and died at Chilwell near Geelong on 22 February 1884. (C.M.G., 1870; K.C.M.G., 1875.)

Slugs. See MOLLUSCA.

Smelt, vernacular name of the genus *Retropinna,* common in fresh-water streams of south-eastern Australia, Tasmania, and New Zealand. The Australian species is small, rarely exceeding three inches in length, but those of Tasmania and New Zealand attain a rather larger size. The Australian smelt occurs throughout the Murray and Darling river-system, as well as in all coastal streams south of the tropics. It is almost transparent, but the eye and the silver skin covering the abdominal walls are opaque. It delights in swift-running streams, and its general habits much resemble those of its distant relative the trout. It is one of the few Australian fishes possessing a minute posterior dorsal fin (known as the adipose dorsal fin) that is characteristic of the salmon family (Salmonidae) of the northern hemisphere. The New Zealand species migrates to salt water to breed, and its young, netted with those of certain species of an allied fish (*Galaxias*), are marketed as 'whitebait.'

A.R.McC.

Smilax, a large and widely distributed genus of the family Liliaceae. The flowers are dioecious; petals fall quickly; fruit a black globular berry. *S. glycyphyl a* (Native Sarsaparilla), is a twiner assisted by slender tendrils; it was one of the earliest plants used medicinally in New South Wales, for a tonic and antiscorbutic. A decoction from the leaves is similar in properties to that made from the roots of *S. officinalis,* the Sarsaparilla of commerce, but is more pleasant to the taste. The False Sarsaparilla (*Kennedya monophylla*), which has purple, pea-like flowers, is a very different plant. *S. australis* has five curved veins on the leaves, and climbs by hooked prickles.

Native Sarsaparilla, and fruit.

Smith, SIR EDWIN THOMAS (1830-1919), born at Walsall in Staffordshire on 6 April 1830 and educated at Queen Mary's grammar school, in 1853 migrated to South Australia, where he built up an extensive brewery business; he retired from active management in 1888. From 1872 to 1893 he represented East Torrens in the legislative assembly, and for a few months in 1884 was minister of education in the Bray ministry; from 1894 to 1902 he represented the Southern District in the legislative council. As mayor of Adelaide (an office which he held in 1880-2 and 1887-8) he was vice-president and chief promoter of the Adelaide jubilee international exhibition of 1887-8, and was knighted for his services. He died at Adelaide on 25 December 1919. (K.C.M.G., 1888.)

Smith, SIR FRANCIS VILLENEUVE (1819-1909), born in Sussex, England, on 13 February 1819, was brought to Tasmania while still a child by his father, who bought the Campania estate near Richmond. The boy was sent back to England for his education, and studied law at University College, London (B.A., 1840, with 1st prize in international law and 2nd in equity). Called to the English bar in 1842, he returned to Tasmania and was admitted there in 1844. In 1848 he acted as solicitor-general, was appointed crown solicitor next year, solicitor-general in 1851 (when he was also nominated to the council) and attorney-general in 1854. The advent of responsible

government did away with this post; but Smith was elected to the first assembly, became attorney-general in the Champ (q.v.) ministry and the short-lived Weston ministry, and in May 1857 formed a ministry of his own which lasted until 1860. In November of that year he was made a puisne judge, becoming chief justice in 1870, and retiring in 1885. The rest of his life was spent in England, where he died on 17 January 1909. He assumed the name 'Villeneuve' in 1884. (Kt. Bach., 1862.)

Smith, GRAFTON ELLIOT, born at Grafton in New South Wales on 15 August 1871, was educated at the Sydney high school and the university of Sydney (M.B., 1893; M.D., 1895; D.Sc. Liverpool, 1923); his post-graduate work included a special study of the brain of the platypus and of marsupials. In 1896 he won the James King of Irrawang travelling scholarship and continued his examination of the mammalian brain at St. John's College, Cambridge; in 1898 he won the British Medical Association's research scholarship and was invited to catalogue the brains in the museum of the royal college of surgeons—the largest collection in the world. In 1904 he was appointed professor of anatomy at the Cairo school of medicine, where he established the anatomical museum and made an exhaustive study of mummies; in 1907-8 he took part in the official archaeological survey of Nubia. In 1907 he was elected a fellow of the Royal Society, and in 1909 he left Cairo to become professor of anatomy at the university of Manchester. During the war he engaged in psychological work in the hospitals for shell-shocked soldiers. In 1919 he was appointed professor of anatomy at University College, London. His publications include *The Ancient Egyptians* (1911); *The Royal Mummies* (1912); *Migrations of Early Culture* (1915); *Shell Shock and its Lessons* (in collaboration with T. H. Pear, 1917); *The Evolution of the Dragon* (1919); *Tutankhamen and the Discovery of his Tomb* (1923); *The Evolution of Man* (1924); *Elephants and Ethnologists* (1924).

Smith, ISAAC (1753-1831), born in 1753 (or possibly towards the end of 1752), entered the navy about 1766 and served under James Cook (whose wife's cousin he was) in the *Grenville*, a surveying brig, off Newfoundland, and in the *Endeavour* during the famous voyage of circumnavigation. At this time he was rated A.B., and Cook described him as valuable for his services 'in assisting to make surveys, plans and drawings, at which he is very expert.' In the Cook family there was a story that by Cook's orders he was the first to land on the shores of Botany Bay (see EXPLORATION BY SEA). On 24 May 1770 he was made a midshipman, on 27 May 1771 master's mate (serving as such with Cook in the *Resolution*), and in 1775 lieutenant; his commission as post-captain was dated 1 December 1787, and he retired in 1807 with the rank of rear-admiral. He saw fighting at the Doggerbank in 1781 under Hyde Parker, and on the East Indies station under Commodore Cornwallis in 1789-93. After retiring from active service he lived with Mrs. James Cook at Clapham, until towards the end of his life a brother bequeathed him Merton Abbey, notable for its memories of Nelson. Here he died on 2 July 1831. J.C.

Smith, JAMES (1827-1897), born on 1 July 1827 at Georgetown on the Tamar in Tasmania, began his business career under a Launceston engineer and miller, but threw up his position to seek fortune on the Victorian goldfields. After a short period of work at Mount Alexander he returned to Tasmania and settled in the valley of the Forth as a farmer, but soon devoted himself to a persistent search for minerals. It was at this time that he became known as 'Philosopher Smith.' In 1859 he discovered gold in the beds of the Forth and the Wilmot; two years later he found silver ore on the beach near Penguin. Pursuing his search into unknown and difficult ranges, he on 4 December 1871 discovered at Mount Bischoff one of the richest tin-mines in the world; he took up two 80-acre sections, from which in 1873 several tons of ore were sent to Melbourne. He then floated in Launceston the Mount Bischoff Tin-mining Company, which on an original capital of £30,000 paid two millions in dividends. His services to the colony were recognized in 1878 by an address and a purse of £250, and in 1879 by a life pension of £200 per annum voted by the local legislature. The prosperity which his perseverance (encouraging many others to similar research) brought to the colony cannot be estimated by these minor rewards. From 1886 to 1888 he had a seat in the legislative council, but found politics uninteresting. He died at Launceston on 15 June 1897.

Smith, JOHN MCGARVIE (1844-1918), born at Paddington near Sydney in 1844 and at the age of 13 apprenticed to the watchmaking and jewellery trade, studied chemistry at the university of Sydney in his spare time, qualified as a metallurgist, and devoted himself successfully to devising treatments for refractory ores. Later he interested himself in bacteriology, erected a specially-equipped laboratory, and engaged a Viennese bacteriologist, Dr. Katz, who was visiting Australia for the Pasteur Institute, to instruct him in microbiology; in 1893 he reported to the metropolitan board of water-supply and sewerage on germs found in the Sydney sewers. He had already (in 1892) collaborated with C. J. Martin (q.v.) in the attempt to discover a vaccine for snakebite, and collected a large variety of snakes for experimental purposes, but after about three years came to the conclusion that the work was impracticable. He did, however, discover a vaccine for anthrax which gives protection by a single inoculation and keeps indefinitely without deterioration, thus allowing its export to any part of the world. During the war of 1914-18 his health failed, and it was feared that he might die without disclosing the formula for this vaccine, which he had kept a close secret. The New South Wales government therefore opened negotiations with him, and in April 1918 he disclosed the formula to Frank Edgar Wall and Frank Tidswell, two well-known medical men who were also expert bacteriologists; he also aided the establishment of a McGarvie Smith Institute, controlled by a board representing the government and the pastoralists of New South Wales, to manufacture and distribute the vaccine. Smith died on 6 September 1918. Since his death large quantities of vaccine have been distributed both throughout Australia and overseas.

Smith, MILES STANIFORTH CATER, born on 25 February 1869 at Kingston in Victoria, and educated privately, at St. Arnaud's grammar school, and at the university of Melbourne, (where he studied engineering), in 1896 went to the Western Australian goldfields and in 1900-1

was mayor of Kalgoorlie. When the first elections for the federal senate took place in 1901, he was returned at the head of the poll in Western Australia. In 1906 he retired from the senate, and in the following year joined the Papuan government service, where he holds the positions of director of agriculture and mines and commissioner for lands and surveys, as well as a dormant commission as administrator of Papua during any absence of the lieutenant-governor. In 1916 he enlisted in the 44th battalion of the Australian Imperial Force, and rose to be a lieutenant. In 1919-21 he acted as administrator of the Northern Territory; in 1923 he was awarded the Patron's gold medal of the Royal Geographical Society of London for his explorations behind Kikori in Papua (q.v.). His report on the system of government, the administration, and the economical development of the Federated Malay States and Java was published as a Commonwealth Blue-book; he has also published a *Handbook of Papua, Australian Campaigns in the Great War,* and *Germany in the Pacific.* (M.B.E., 1921.)

L.A.

Smith, Sir Ross Macpherson (1892-1922), born at Semaphore in South Australia on 4 December 1892, and educated at the Queen's School, North Adelaide, and at Moffat in Scotland, entered on a business career in Adelaide. On 10 August 1914 he enlisted in the A.I.F. with the 3rd Light Horse (2nd lieutenant, 1915; lieutenant, 1916; lieutenant A.F.C., November 1917; temporary captain, November 1917; captain, October 1918). On 22 October 1914 he left with his regiment for Egypt, served on Gallipoli, and in September 1915 was invalided to England; in April 1916 he was back in Egypt, was transferred to the machine-gun section of the 3rd light horse, and took part in the battle of Romani. In October 1916 he qualified as observer in the Australian Flying Corps, and was attached to No. 1 squadron until the end of the war. His air service was marked by conspicuous gallantry in combat and invaluable work in reconnaissance and photography, especially on long distance flights. He was one of the escort of the patrol of No. 1 squadron which re-mapped the Turkish front-line region in January 1918; in the following May he landed Colonel Lawrence on the El Kutrani plains, after a flight from Allenby's headquarters; in June he made the first British reconnaissance of Haifa, and in the same month was one of the two airmen who 'shot up' the Nablus railway, thus initiating a series of machine-gun attacks on Turkish troops and depots with reconnoitring machines. He was made pilot of the giant Handley-Page plane brought out from England to take part in Allenby's last offensive, and opened the drive by bombing enemy centres on the night of 16 September. On 29 November 1918 he left Cairo with Generals Borton and Salmond in the Handley-Page machine on a flight to India. On arrival in India Borton received permission from the air ministry to arrange for the survey of an air route to Australia; Smith accompanied him, and a route was laid down as far as Timor.

On returning to India it was learned that the Australian government had in March 1919 offered a prize of £10,000 to the first Australian airman who should reach Australia by air from England; the flight must be accomplished in 720 consecutive hours (30 days) in a machine —aeroplane or seaplane—wholly constructed within the British Empire and manned by an all-Australian crew; one machine only might be used on the flight, though replacement of parts and repairs to motors might be made *en route*; the offer remained open until midnight of 31 December 1920. Ross Smith returned to England in September 1919 and arranged with Vickers Limited for a Vickers-Vimy machine with two 360-horse-power Rolls-Royce engines. As crew he chose his brother Keith Smith to be navigator and assistant-pilot, and Sergeants J. M. Bennett and W. H. Shiers, who had accompanied him to India, as mechanics. Depots were arranged along a route running over France, Italy, Crete, Egypt, Palestine, Mesopotamia, Persia, India, Burma, the Federated Malay States, and the Netherlands Indies to Darwin. By the end of October all was ready, but atmospheric conditions delayed the flight until 12 November; Captain Matthews and Sergeant Kay, who left in a Sopwith-Wallaby machine on 21 October (see Aviation), thus had a good start of the party. Smith's flight was without noteworthy incidents until they passed Akyab in Burma on 30 November, when they caught up with the French airman Lieutenant Poulet, who in an inadequate machine was also trying to reach Australia. They barely escaped a smash at Singora in Siamese Malaya, where the landing-place was unsuitable; on 5 December they reached Kalidjati near Batavia in Java, and were welcomed by the governor-general of the Dutch East Indies, who facilitated the remaining stages of the flight by preparing aerodromes at several points on the Dutch islands. At Surabaya on the 6th the machine bogged, and was extricated only with the greatest difficulty; on the 10th, at 8.35 a.m., the airmen left Timor on the last stage of their flight, made the sea-crossing successfully (passing *en route* H.M.A.S. *Sydney,* which had been stationed in those waters to help them in case of need), and in the early afternoon reached Darwin. The flying-time was 135 hours, and the distance covered 11,340 miles. For their achievement the officers were knighted (K.B.E., 1919) and the mechanics received commissioned rank and the Air Force medal.

After a stay of some months in Australia Ross Smith left for England to make arrangements for a flight round the world. The route was familiar to him as far as Burma; thence he proposed to cross China, Japan, the Aleutian Islands, Alaska, the Canadian lakes, New York, St. John's in Newfoundland, the Azores, and England. He secured a Vickers-Viking (amphibian) machine, and accompanied by Lieutenant J. M. Bennett took it up for trial on 13 April 1922; the flying conditions were favourable, and the machine flew well for a quarter of an hour, but suddenly developed a spin and crashed with a nose-dive on an iron fence. Ross Smith was killed instantly, and Bennett died two minutes later. His elder brother, Sir Keith Macpherson Smith, born at Adelaide in South Australia on 20 December 1890 and educated at the Queen's School, North Adelaide, and at Moffat in Scotland, had also entered on a business career in Adelaide when the war of 1914-18 broke out. He was rejected for service with the A.I.F., but proceeded to England, enlisted in the Royal Flying Corps in July 1917, was engaged as flying instructor and aerial gunnery officer, and in 1918 was mentioned in despatches. Towards the end of the war he was transferred to the Australian Flying Corps. As navigator and assistant-pilot he accompanied Ross Smith on his flight to Australia, and intended to ac-

company him on the world-flight of 1922. Since his brother's death Sir Keith Smith has devoted himself to aviation as a business. (K.B.E., 1919.)

Snails. See MOLLUSCA.

Snake-bird. See DARTER.

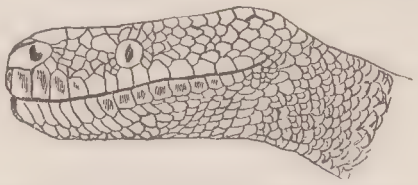
Snake-flies. See MEGALOPTERA.

Snakes, vernacular name of the reptilian order Ophidia, elongated vertebrates without limbs (except as vestiges in the python family), widely distributed over the world. Their principal sense-organ appears to be the slender, deeply-forked tongue, which, when seen characteristically protruding and quivering in its task of making investigations, is often mistakenly referred to as a 'sting.' Each eye is covered with a transparent scale, there being no eyelids. The lower jawbone consists of two distinct sides, which are connected in front by an elastic ligament; each side articulates with the skull by means of a bone (the quadrate) often loosely suspended, and most snakes are thus able to swallow objects which may exceed the normal diameter of their bodies. The body is covered with scales, which generally overlap. In most species there are on the head a number of enlarged scales or shields whose shape and relative proportions are of great value in classification. On the lower surfaces there are large transverse shields (absent in the blind snakes, and usually reduced in sea-snakes), which form either a single or a double series below the tail. A thin layer of outer skin, including the covering of the eye, is shed periodically, often several times in the year. The process commences at the lips, and the skin is usually turned inside out, except the extreme end of the tail; just before this takes place, the eye often has a glazed appearance, and in some species the snake is practically blind for the time being. All the body vertebrae bear ribs; these, and the muscles associated with them, are the principal agents in locomotion. The number of pairs of ribs corresponds with the number of ventral shields. The male copulatory organs are paired, each being lodged in a recess at the base of the tail on each side; when protruded, they are turned inside out. The presence in the python family (Boïdae) of rudimentary hind-limbs, which appear externally as claws, is regarded as evidence that snakes had ancestors with functional legs.

More than two-thirds of the Australian species are venomous, but only a dozen are really dangerous, and some of these are very rare. Distinctions between venomous and non-venomous species were set out in simple language by Krefft in 1869, but later discoveries show that some of his remarks do not hold good for all Australian snakes. It is true, however, that a complete bite from a large venomous snake may be distinguished by the presence of two punctures over a quarter of an inch apart, made by the poison-fangs—in a large death adder the fangs are fully

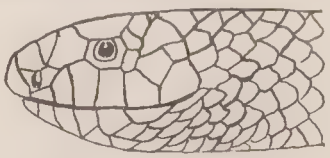
Head of Green Tree-snake (*Dendrophis punctulatus*).

half an inch apart—whereas a complete bite from a harmless snake would show two curved rows of tooth-marks. The shape of the mouth is often a guide. The harmless freshwater snake, the green tree-snakes, and the venomous (but not dangerous) brown tree-snake have a curved gape, very distinct from the almost straight gape of the mouth in large venomous species. In pythons, however, the gape is straight. Stress was formerly laid on the absence of a loreal (a shield



Head of Carpet Snake (*Python spilotes* var. *variegatus*).

between the nostril and the small shields in front of the eye); but *Hornea pulchella*, a venomous snake from central Australia, is an exception, and in other species the shields are occasionally divided in such a way as to cause confusion on this point. The presence of six upper labials (enlarged shields bordering the gape on each side)—the rostral, or shield in front of the mouth, not being counted—is often quoted as a distinctive mark of a venomous snake. There are, however, marked exceptions; a large poisonous species (*Pseudechis scutellatus*), allied to the common



Head of Black Snake (*Pseudechis porphyriacus*).

black snake, has occasionally a seventh labial, and the same applies to the venomous Clarence River snake, *Tropidechis carinatus*. This seventh labial is formed by a large shield which comes between what are normally the fifth and sixth labials, making a series of seven; to escape the difficulty by calling this shield a temporal, and not a labial, is misleading. The common (and venomous) brown, black, tiger, and superb snakes and the death adder have only six labials. With the exception of the green tree-snake (which has usually eight but occasionally seven) and a rare northern species (*Fordonia leucobalia*, which has only four), the other harmless snakes have at least eight labials, while the pythons have ten or more. These distinctions do not apply to the sea-snakes or the blind snakes, or to the harmless aquatic *Acrochordus* and *Chersydrus* from the far north. These last two have no distinct labials.

Head of venomous snake, showing venom-gland, duct, and fang.

The poison-apparatus of a venomous snake is arranged so that the more or less deadly contents of the venom-gland are conveyed deep into the wound made when the reptile bites. In the great

Drawn by Edith A. King.

1. Coral Snake (*Rhynchelaps australis*).
2. Young Brown Snake (*Demansia textilis*).
3. Tiger Snake (*Notechis scutatus*).

majority of Australian venomous snakes the fangs are sharply-pointed enlarged teeth placed near the front of the mouth on each side of the upper jaw; they are sometimes double on each side (the second being close by), and when broken they can be renewed. They are rarely more than ¼-inch in length, and the base is more or less invested with fleshy tissue. At the base of each fang is an opening for the duct from the venom-gland; from this opening a groove continues down the tooth, and opens near the sharp point; the groove is almost a complete tunnel, but on the outside in front the line of union where its sides come together is plainly visible. When a snake bites it often 'hangs on' and is difficult to shake off, its object being to inject as much venom as possible. When a person is bitten through thick clothing, much of the venom may be absorbed, and the danger is minimized. The venom itself is secreted in oval poison-glands situated on each side of the head behind the eye; these are analogous to the upper salivary glands of higher vertebrates, and it is interesting to note that the saliva of certain snakes not equipped with fangs has been found noxious. When the snake bites, the gland is compressed by muscles, and the venom squeezed through the duct and down the canal.

Various snakes are adapted to very different conditions of life. The venomous sea-snakes (Hydrophinae) are as much at home in the sea as fishes. The common black snake, although a land form, is a good swimmer, and can remain below the surface for at least 20 minutes. The harmless freshwater snake (*Tropidonotus picturatus*) is semi-aquatic, but often found at a considerable distance from water. The blind snakes (Typhlopidae) are subterranean burrowers, their scales being smooth and polished. Several small venomous snakes, including species of *Pseudelaps* and *Furina*, seem to spend most of their time below the surface. The green and brown tree-snakes are characteristically found in trees; the carpet and diamond snakes are terrestrial, but are also expert climbers. Except in the tropics Australian snakes have a more or less prolonged period of hibernation. During the colder months the larger forms retire under the ground, and many of the smaller species find shelter under logs and stones. Occasionally several specimens may be found hibernating together. In mine-workings snakes have been noted at a surprising distance from the surface.

Because of their sluggish disposition snakes are able to live for a lengthy period without food. G. A. Boulenger quotes the case of a Madagascar boa that remained alive without food for four years and a month. Valuable species in zoological gardens sometimes have to be forcibly fed in order to keep them alive. Many snakes are fond of lying in water, and some apparently draw in liquid through the mouth when the head is immersed. The stories of snakes sucking milk from cows have no foundation in fact. In their natural condition all snakes fast when hibernating. Most prefer to eat prey which they capture alive, but in captivity some will not refuse animals that have been previously killed. When two or more carpet snakes are kept together, it is no rare thing for two to seize the same rat; should one be much larger than the other, it will encompass the rat and proceed to engulf the smaller snake as well. In most cases one specimen will disgorge the rat and jerk itself free to avoid being swallowed. A snake generally seizes its prey by the head, but the writer has noted several exceptions.

When a carpet snake is about to attack an animal, the fore-part of its body forms sinuous curves sideways—not up and down; when within distance it strikes swiftly, first using its teeth to seize the prey and then throwing coils round the doomed creature, the whole operation being done almost too quickly to be visualized. When the prey is crushed to death the snake often swallows it leisurely; it does not first cover it with slimy mucus, as is sometimes supposed. In swallowing, the two sides of the lower jaw are moved forward alternately. When making a big meal, the glottis may be seen protruding at the side of the mouth, so as to enable the snake to breathe. Occasionally small species of ticks are found attached to snakes, and internal parasites are common.

The carpet snake and certain other species are useful in so far as they prey upon rodents, and the blind snakes often feed on white ants, but ophidians as a whole cannot claim economic value. Tanned skins of the larger species are being increasingly used for belts, purses, handbags, etc. Although much prized by the aborigines, snake-flesh is never likely to prove a popular article of diet. Snakes have many enemies besides man; these include the kookaburra and certain other birds, several large lizards, dogs, and the domesticated pig.

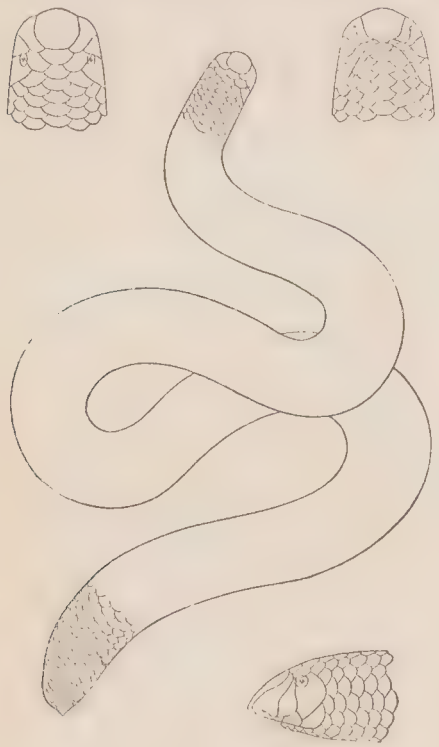
Most stories that represent young snakes as taking refuge in the mouth of the mother are the result of a vivid imagination or of faulty observation. In the light of recent evidence, however, the question cannot be altogether dismissed, and one or two American naturalists have published instances which seem to establish the truth—in rare cases—of this curious habit. It has at any rate been definitely recorded that certain snakes in captivity have swallowed their own offspring, but without disgorging them. Several species are known to be cannibalistic.

The length of a snake and the weight of a fish are questions about which the ordinary man is prone to exaggerate. The giant pythons from northern Queensland reach 20 feet, but a dried skin of this large species, with its imbricated scales, may stretch to at least 25. By actual experiment it has been shown that the skin of an 11-foot python, when taken off and dried, measured 15 feet.

Most Australian snakes are oviparous; this characteristic does not, as is sometimes alleged, form a distinguishing feature between venomous and non-venomous kinds. So far as is known, all blind snakes and pythons are oviparous; the carpet snake lays about 30 or more eggs, which are generally stuck together—the female protects and partly incubates them by coiling herself round them, a slight rise of temperature being then noted. Among other harmless oviparous species may be mentioned the green and brown tree-snakes and the freshwater snakes; but the common brown snake (which is venomous) and the whip snake are also oviparous. The death adder brings forth about 15 young alive, the black snake 15 to 20; from a brown snake 23 eggs have been taken, and a tiger snake may produce over 30 living young.

About 115 distinct species of snakes are found in Australia, representing three out of the nine ophidian families; these are the Typhlopidae (blind snakes), Boïdae (constricting snakes), and Colubridae, a family which includes both harmless and venomous snakes. The blind snakes are burrowing, round-bodied reptiles, with rudimentary eyes, and no teeth in the lower jaw. The tail, which is of the same diameter as the head

and body (occasionally a little thicker), is short, and ends in a small horny spine. The body is covered with uniform scales, usually smooth and shining. Twenty Australian species are known, all members of the genus *Typhlops*. These range from thin worm-like snakes, about six inches long, to specimens over two feet in length with a diameter of about half an inch. All are quite harmless. Edgar R. Waite states that they feed chiefly, if not exclusively, on insects, and destroy



Blind Snake (*Typhlops pinguis*).

numbers of white ants and their eggs. Some species, when first captured in the ground, have a very strong smell, probably associated with sexual habits. Several species have the rostral (front shield of the head) sharply curved; one, indeed, is named *T. curvirostris*. A widely distributed species, *T. bituberculatus*, has a little knob-like process above each nostril. *T. polygrammicus* is one of the largest of the blind snakes (sometimes over 28 inches in length), and *T. wiedi* is a small elongated species.

The Boïdae include the giant ophidians found in all tropical countries. Vestiges of hind-limbs appear externally as small claws near the vent. These snakes kill their prey by squeezing it in their coils. The best-known Australian species is the Carpet Snake (*Python spilotes*, var. *variegatus*, plate xliv, fig. 3), also found in Papua. The closely allied Diamond Snake (*P. spilotes*) is only found in Eastern New South Wales (plate xlvi, fig. 2). The carpet snake grows to over ten feet, but most specimens are about eight feet when adult. It feeds principally on bandicoots and other small marsupials, and on rats. In northern Queensland a far larger python (*P. amethystinus*) is found; specimens 20 feet long have been measured. These snakes have about 400 vertebrae, with the ball and socket articulation that is so characteristic of reptiles generally. An adult would be able to swallow a fair-sized wallaby. Unlike the carpet snake, this northern python has large shields on the top of the head. Although they are non-venomous, a bite from these constricting snakes is not to be invited, and wounds inflicted by their strong reflexed teeth often refuse to heal easily. The two pythons just mentioned have no fewer than five series of teeth, in addition to those of the lower jaws. Six other species of Boïdae are known in Australia, of which the Black-headed Snake or Tarpot (*Aspidites melanocephalus*) is not uncommon in northern Australia. The series of scales (at least 38) round the body are far more numerous than in venomous species. Three species of rock python are included in the genus *Liasis*; these are for the most part confined to northern Australia, though *Liasis childreni* is occasionally found near Brisbane.

Australian snakes of the family Colubridae (which includes the great majority of the world's Ophidia) may be divided into three sections:—Aglypha (all the teeth solid), Opisthoglypha (one or more of the posterior upper —maxillary—teeth grooved), and Proteroglypha (the anterior upper teeth—the enlarged poison-fangs—grooved). The last section is again divided into two sub-families, (*a*) Elapinae, venomous land-snakes with cylindrical tails, (*b*) Hydrophinae, venomous sea-snakes, with the tail flattened and oar-like.

The best-known of the Aglypha are the Green Tree-snake (*Dendrophis punctulatus*), shown on plates xliv, fig. 1 and xlvi, fig. 1, and the Common Water-snake (*Tropidonotus picturatus*), both harmless. The former is green above, but when angry flattens its neck vertically and exhibits a beautiful peacock-blue colouring between the body-scales. The forepart of the body below is usually of a rich yellowish colour. This snake is an expert climber, using the angular keels on its ventral scales in a remarkable way. It grows to about seven feet, and feeds upon frogs and lizards. A young specimen of the common water-snake has been seen to climb the vertical glass sides of a case, which were damp at the time; its ventral scales being so arranged as to form suction areas, it was able to cling to the glass in this way when clear of the floor. This snake grows to about three feet; the upper scales are keeled, and the colour is variable. A remarkable member of this series is the Elephant's Trunk Snake (*Acrochordus javanicus*), only found in the far north. It is sometimes called the 'file snake' from its rough scales, and is a widely distributed, chocolate-coloured, aquatic snake which grows to about eight feet and feeds principally on fishes (see plate xlvii, fig. 2).

The only well-known species of the Opisthoglypha is the Brown Tree-snake (*Dipsadomorphus fuscus*), sometimes called the Red Snake or Copper-snake (plate xlvi, fig. 3). This is a handsome nocturnal snake, reddish-brown above, sometimes with darker bands. Its head is very distinct from the neck. Although venomous, it is not regarded as dangerous; its poison-fangs are at the back of the mouth. It feeds on birds and frogs, and grows to over six feet.

The Proteroglypha of the Australian region include about 70 venomous land-snakes and over a dozen marine species. The majority of the venomous land-snakes are too small to be dangerous, and many are rare. The smallest of the Australian Elapinae is *Pseudelaps kreffti*, which grows to about 9 or 10 inches in length. The longest Australian venomous snake is the

Queensland *Pseudechis scutellatus*, allied to the common black snake; it grows to at least 9 feet. In 1923 J. R. Kinghorn established the genus *Oxyuranus* for a large venomous snake over 9 feet long, with special osteological characters, which had been found on the Cape York Peninsula; it is possible that *P. scutellatus* really belongs to this genus. In eastern New South Wales and southern Queensland specimens are occasionally found of a brown snake with 23 scales round the body (which are more or less distinctly keeled in the adult), and with seven upper labials. This is *Tropidechis carinatus*, the Clarence River Snake. In life this snake sometimes has at the back of the head a light band edged by black scales, and there may be regular rows of darker spots along the body.

The genus *Demansia* (apparently derived from the old name of Tasmania, which was occasionally spelt 'Van Dieman's Land'—hence many writers prefer to use 'Diemenia') contains ten species, of which the best-known are *D. psammophis* (Whip Snake, plate xlvi, fig. 5), and the larger brown snakes; of these there are at least five species in Australia, all dangerous. The commonest is *D. textilis* (plate xlv, fig. 2), which grows to six feet in length. About 20 eggs are laid, and the young are at first marked with a number of black rings. Plate xlvi, fig. 6 shows a slough or cast skin of the brown snake. *D. nuchalis* has a large shield-like rostral, unusually elongated, on the top of the head. The common whip snake, which grows to over four feet, and is not usually regarded as dangerous, is found practically throughout Australia, as well as in Papua. In captivity it appears to prefer a diet consisting of small lizards.

The ordinary Black Snake (*Pseudechis porphyriacus*), perhaps the commonest of the large venomous snakes, is frequently found near water, where it feeds on lizards and frogs. In captivity it has been known to devour a small whip snake. It is figured on plate xxiv. Few specimens reach the length of six feet. The reddish colour of the under-surface is very noticeable; near Brisbane a closely allied species is found with a bluish belly. Just after an old outer skin has been shed, the metallic sheen of the upper surface is striking. About ten other species of *Pseudechis* have been described; *P. australis* (Mulga Snake) is a brown venomous snake found in mulga country. In the black snake the shields below the tail are unusual in being single anteriorly and paired behind; the body is bluntly triangular, not circular. When disturbed, this snake flattens its neck—a common habit with venomous species, notably with the Indian cobras. The rare Yellow-spotted Black Snake (*P. guttatus*) of Queensland feeds on other snakes when in captivity and has been known to swallow a death adder. There are several small black snakes in the genus *Denisonia*, which bear only a very superficial resemblance to the true *Pseudechis*. The genus *Rhynchelaps* (plate xlv, fig. 1) contains several small species—mostly banded, with short tails, and with the rostral shield curiously produced in front.

Other small black snakes are classed under *Pseudelaps*, the commonest being *P. harriettae* (White-crowned Snake, because of the white circlet on the top of its head, plate xlvii, fig. 3). Another species (*P. diadema*) has a red (rarely whitish) patch at the back of the head. *Pseudelaps squamulosus* (Red-bellied Snake), from Queensland and New South Wales, is a short venomous species characterized by the striking scarlet colour of its lower surface; *Hoplocephalus bitorquatus* (Pale-headed Snake, plate xlvii, fig. 1) is a smaller broad-headed venomous species with a whitish head, frequently found in the eastern States. *Furina annulata* (Bandy-bandy, Black-and-white-ringed Snake), another common venomous kind, sometimes grows to 30 inches; the mouth is small, the fangs tiny, and very little use is made of them—the writer has handled more than 30 specimens, not one of which made the slightest attempt to bite. This species is better known as *F. occipitalis*, but the specific name *annulata* has priority. See plate xxiv, fig. 5.

The Tiger Snake (*Notechis scutatus*, shown on plate xlv, fig. 3), is the most deadly of all Australian snakes. This pugnacious reptile is typically marked with many dark cross-bands on the back, but some adults are entirely brown, of various shades. It is found in Tasmania as well as on the mainland, but authentic examples have not been examined from northern Queensland. The Desert Snake (*Brachyaspis curta*), from Western Australia, is a distinct species. Another dangerous snake is the Copper-head (*Denisonia superba*), not infrequent in Tasmania and the southern parts of New South Wales, Victoria, and South Australia; in Tasmania it is sometimes known as the carpet snake. The Death Adder (*Acanthophis antarcticus*) is a short, clumsy snake, with a blunt triangular head, and a short tail ending in a horny spine (see plate xxiv, fig. 6). A few specimens have measured up to three feet in length, but the average is under 24 inches. From its disinclination to move when approached it is sometimes called 'deaf adder.' The colour in adults is very variable, and the dark bands that are a prominent feature in the young may be maintained throughout life. This snake is sometimes seen in sandy country with only its head exposed. It strikes swiftly, and (with the exception of *Pseudechis scutellatus*) has the largest fangs of any in Australia. The spine at the end of the tail is quite harmless, notwithstanding the many stories to the contrary. When angry, it flattens its body to a surprising extent. The death adder is also found in Papua; in central Australia it is represented by a species with very rough scales of a brick-red colour.

To the Proteroglypha also belong the sea-snakes (Hydrophinae), which vary so much individually that their classification is very difficult; probably several of the species recorded as existing in Australian waters are not really distinct. All sea-snakes are venomous, but when washed ashore they are too helpless to be dangerous unless carelessly handled. The nostrils, on the tip of the snout, are closed by valves. One lung is rudimentary (as is usual in all snakes); but in some marine species the remaining lung-structure reaches almost from end to end of the body. The food consists of small fishes.

The Yellow-bellied Sea-snake (*Hydrus platurus*, plate xliv, fig. 2), the most widely distributed snake in the world, is not infrequently found in Australian waters; the skin of one found in 1916 at Caloundra in Queensland measured 45¾ inches. This snake is usually black above and yellowish below, with a variegated tail. Another common sea-snake, *Disteira* (*Hydrophis*) *elegans*, is very slender in the fore-part of the body and bulky behind; its colour is usually a yellowish-white above, with many transverse black spots and bands. Species of *Platurus* and *Hydrelaps* are known as ringed sea-snakes; the young are born

alive, sometimes on a rock-strewn bottom near the shore. Adults of the larger species of Hydrophinae are rarely more than 6 feet in length, and no sea-snake yet known is long enough to substantiate the stories of sea-serpents (q.v.). The stoutest species is the smooth-scaled *Aipsyurus laevis*, which may attain a diameter of 6 inches.

Vernacular names.—The use in different parts of Australia (and occasionally in the same district) of the same popular name for very distinct snakes has created great confusion. This is partly due to local variations in colour; for instance, some forms of the harmless green tree-snakes are quite black, as are some forms of the brown tree-snake. The name 'tiger snake' belongs properly to the dangerous *Notechis scutatus*, but has been used for the brown tree-snake, the black-headed python, and the rare western Queensland species *Demansia carinata*. 'Carpet snake,' a name correctly applied to the common python of the mainland, is sometimes used in Tasmania for the large-scaled venomous *Denisonia superba*. Even a lance-head lizard (*Lialis burtoni*) has been dignified with the name 'spinifex snake.'

Aboriginal legends, etc.—Among the aborigines there were several legends of large snakes. The Kakadu tribe (in the Coburg Peninsula) believed in a monster who was supposed to have devoured many blackfellows; their bones, subsequently ejected, were still to be seen as stones 'the size of a great hill.' The medicine-men made use of this tradition in curious ways, and although this snake ('Numereji') was said to be invisible to ordinary natives, its blood was used in initiating a new 'doctor.' In some tribal ceremonies a snake-symbol was an important feature, and the movements of snakes were imitated by dancers. In the Warramunga tribe the snake totem was represented by elaborate sinuous coloured bands drawn on the ground (see plate i). There was evidently a belief that the snake-totem group of natives was actually related to the reptile. In some tribes men were supposed to be protected against snake-bite by being painted with red ochre and then smoked over a fire of green twigs. The aborigines frequently used snakes as food, and were fearless in capturing non-venomous species. Baldwin Spencer reports that the Kakadu men kill snakes by placing the head in their mouth and then forcibly jerking it free from the vertebral column.

Roth reports several aboriginal methods of treating snake-bite, including sucking the wound by a medicine-man, rubbing the faeces of the snake into the wound, and the eating of raw bark from the Leichhardt tree (*Sarcocephalus cordatus*), which caused the victim to vomit. He records the use of ligatures in the Boulia and Cloncurry districts—but these may not have been deliberately used to arrest the circulation of the venom. A special treatment for snake-bite was the use of a vapour-bath, reported by Roth as follows: 'Having dug a largish hole, a fire is kindled in it and some big stones and lumps of rock heated thereby. When these have become sufficiently hot and the flames somewhat subsident, a number of fresh leafy boughs and branches and leaves, sprinkled with water to prevent ignition, are placed on top. Upon this smoking mass of foliage the bitten individual now lies, and what with the smouldering embers and hot steam arising from the leaves he soon becomes enveloped in perspiration, falls asleep for two or three hours, wakes up refreshed, has a "spit," and is quite recovered.'

Snake-bite.—During the period 1918-23, 96 deaths from 'venomous bites and stings' were recorded in Australia; the minimum was 7 in 1918, the maximum (an altogether exceptional number) 60 in 1923. This gives an average mortality of only 16 a year, of which the greater number, probably, represent snake-bites.

The symptoms of snake-bite vary greatly; some patients have been described as 'restless and excited,' but drowsiness is a commoner condition, and faintness a frequent symptom—sometimes the patient staggers as if drunk. Out of 190 cases noted (and published in 1906) by Tidswell there were 31 fatalities; they included bites from death adders, tiger snakes, brown and black snakes, but black snakes caused no deaths. By the injection of prepared venom into rabbits it has been shown that the venom of the tiger snake is the most powerful, the death adder and the brown snake coming next, and the black snake last. Of all Australian snakes the death adder apparently injects the greatest quantity of venom. The recommended treatment is as follows:—

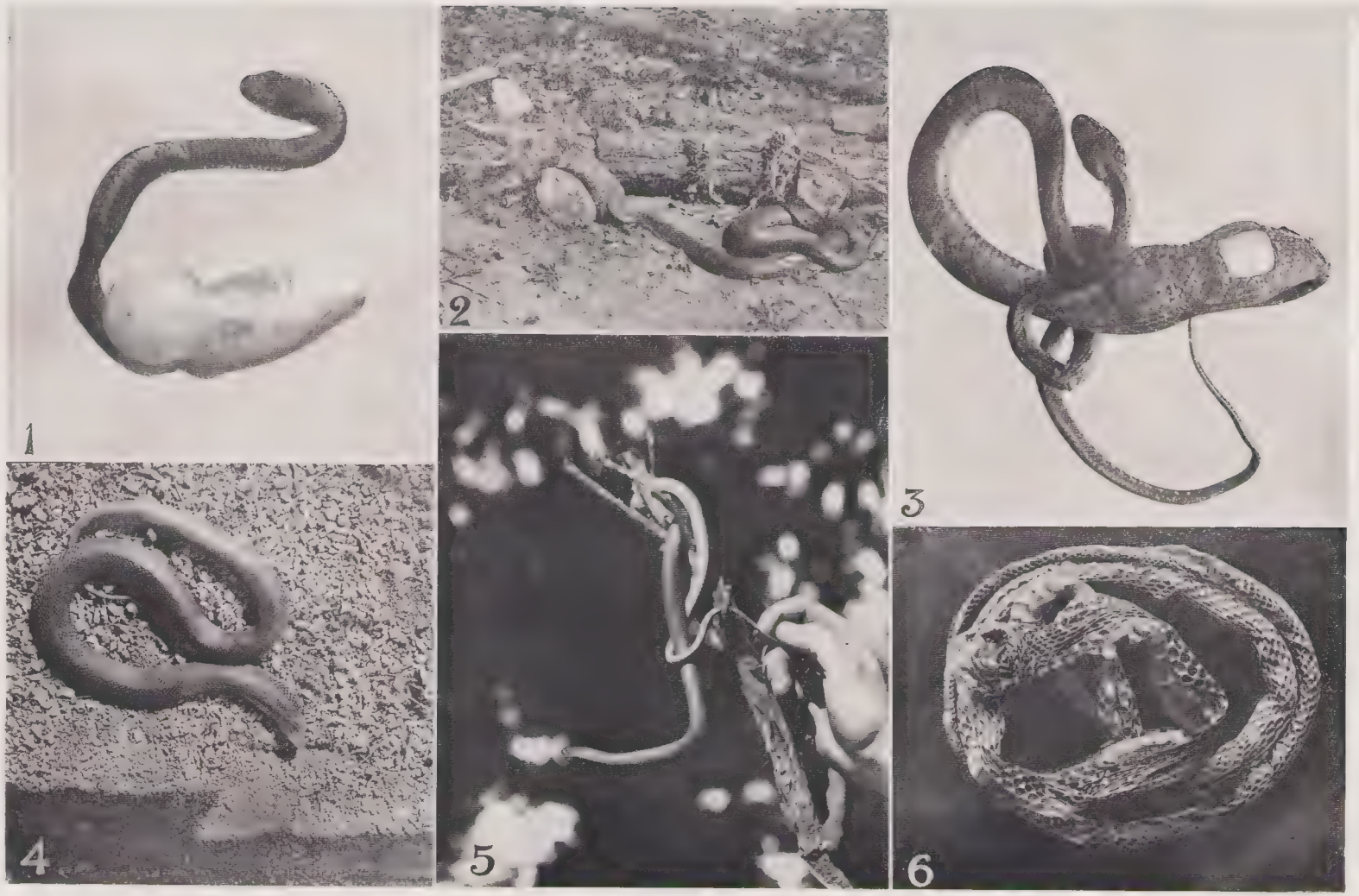
1. Apply a ligature—i.e. tie a piece of string, a strong strip of clothing, or a bootlace, just above the bitten part, between the wound and the body. This should be tightened by passing a stick under it and twisting until the circulation is stopped.
2. Cut the wound sufficiently to expose the area where the fangs have penetrated, and rub in Condy's crystals or permanganate of potash, moistened with a little water or saliva.
3. Obtain medical advice. If necessary, administer small doses of a stimulant, such as strong tea or coffee, or alcohol. The patient should not be exhausted by violent exercise.

Sucking the wound is often recommended; but, unless the mouth and teeth are sound and the matter is wholly expectorated, this may endanger the operator. The object of the ligature is to stop the circulation of the blood and retain the venom in the actual wound. It is often advisable to attach a second ligature higher up. Do not keep the ligature tight for more than half an hour; it should then be slackened, to allow the blood to return temporarily, and then tightened up again. Ligatures should not be kept on for more than an hour, except under medical supervision, as a too long-continued constriction may induce mortification of a limb. When obtainable, a piece of strong rubber makes the best ligature.

Should a person be bitten on a fleshy part of the body, where ligatures cannot be applied, the wound should be scarified and blood made to flow. Efforts should in this case be made to suck out the poison, and permanganate should then be rubbed in. Care should always be taken not to cut through sinews or large blood-vessels.

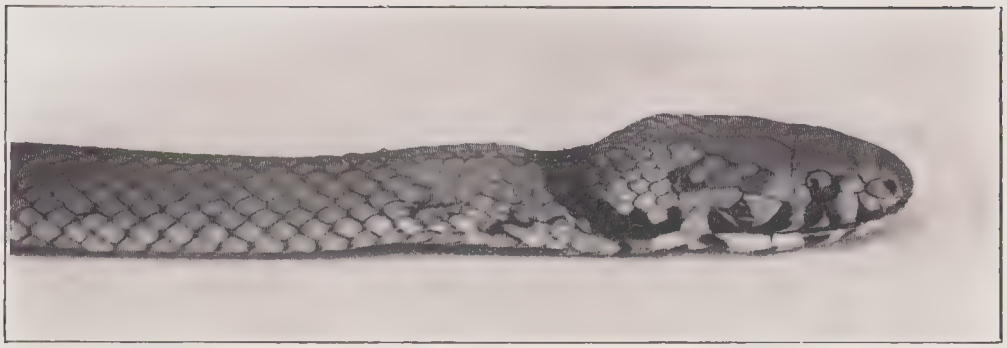
The permanganate neutralizes the poison; injecting a solution is better than rubbing in crystals. Experiments show conclusively that, when snake-venom and a solution of permanganate are injected together, no serious symptoms result. A little outfit, consisting of a mounted lancet and a receptacle for the crystals, can be obtained for a small sum; it is of use only when applied within a few minutes after a person has been bitten.

The best possible antidote for snake-bite is an injection of antivenine, which is prepared by immunizing a horse with gradually increasing doses of pure snake-venom. Tiger-snake anti-

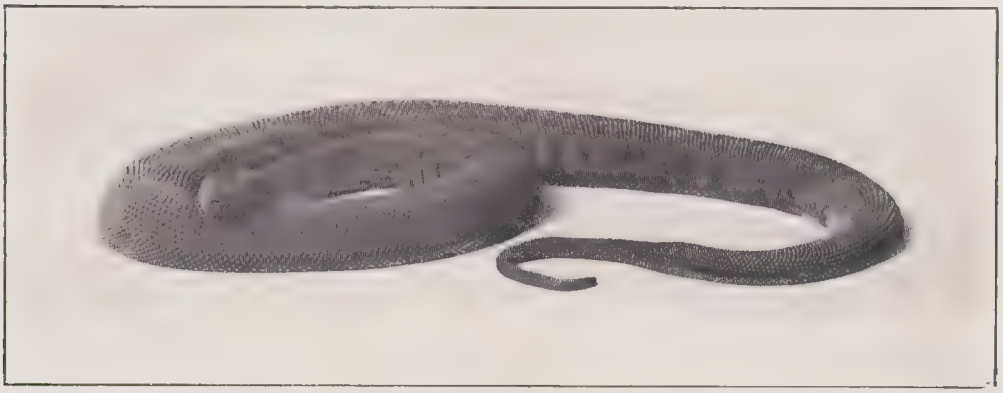


1. YOUNG GREEN TREE-SNAKE (*Dendrophis punctulatus*) emerging from egg. Non-venomous.
2. DIAMOND SNAKE (*Python spilotes*) swallowing a hare. Non-venomous.
3. BROWN TREE-SNAKE (*Dipsadomorphis fuscus*) cut open to show two fowl's eggs which had been swallowed whole. Slightly venomous.
4. BLUE-BELLIED BLACK SNAKE (*Pseudechis mortensis*) showing distended neck of angry snake. Venomous.
5. WHIP SNAKE (*Demansia psammophis*). Slightly venomous.
6. SLOUGH OR CAST SKIN OF BROWN SNAKE (*Demansia textilis*). Venomous.

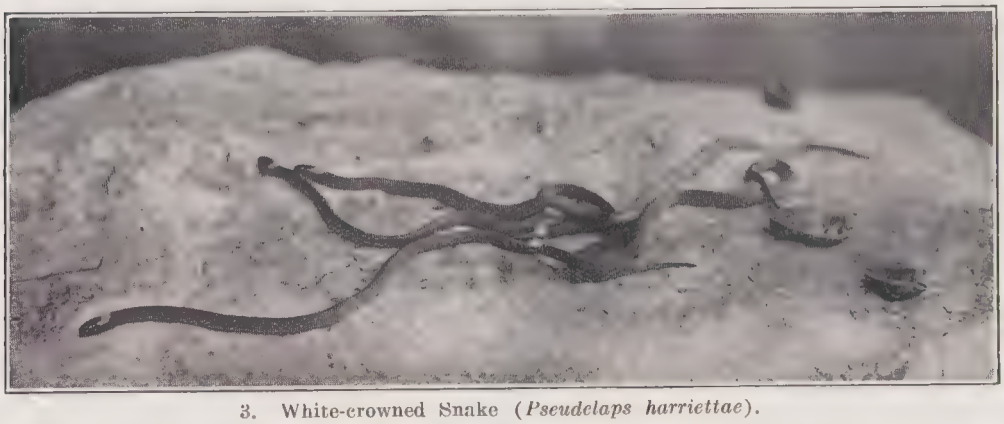
Plate XLVI



1. Pale-headed Snake (*Hoplocephalus bitorquatus*). Venomous.



2. Elephant's Trunk Snake (*Acrochordus jarvanicus*). Non-venomous.



3. White-crowned Snake (*Pseudelaps harriettae*).
Five newly-hatched specimens with remains of eggs. Slightly venomous.

4. Laughing Jackass trying to swallow a Green Tree-Snake.

venine has been prepared by Tidswell, and experiments show its value for bites from that snake. Unfortunately, it is not an antidote for other species, and an antivenine which will counteract the venom of all our snakes has yet to be discovered.

Certain general characteristics of snakes are briefly outlined under REPTILES, where a summary is given of the literature of the Australian species. H.A.L.

Snake's-tongue Fern. See FERNS.

Snapper, vernacular name of *Pagrosomus auratus*, the finest game and edible fish in Australia, commanding the highest price in all markets. It occurs round rocky reefs all along the southern half of the mainland, Tasmania, and New Zealand, but schools at certain seasons in open water. The very young fish are commonly called 'cockneys,' and those of somewhat larger size are known as 'red bream;'

Snapper.

from this stage they develop into 'squire,' and finally into snapper. Full-grown examples develop a large bony protuberance on the nape, and a peculiar flabby and fleshy nose, which produces a somewhat human appearance and has earned for them the name of old-man snapper. The Long-spined Snapper (*Argyrops spinifer*) is an allied fish of tropical waters, in which the dorsal spines are greatly prolonged into fine hair-like filaments. A widely different fish is the Red Snapper (*Trachichthodes gerrardi*) of South Australian markets, for which see NANNYGAI.

Though the common snapper is plentiful off the coast of Southern Queensland, it gradually gives place northwards to the King Snapper (*Lutianus sebae*), which reaches a length of three feet and a weight of 12lb. In its younger stages it is cream-coloured, with scarlet bands so arranged as to suggest a broad-arrow (for this reason it is often known as 'government bream'), but later it develops a uniform rich pink tint, with scattered pearly spots. A number of species of *Lutianus* and allied genera occur in tropical waters, and a few occasionally extend southward into cooler latitudes. All are fine edible fishes, and are usually highly ornate with brilliant colours. The Hussar (*L. amabilis*) is rose-pink above and silvery below, with a broad greenish-yellow band along each side. The blue-and-gold fusilier, yellow-banded sea bream, and paradise-fish are allied species whose names indicate their coloration. A.R.McC.

The name 'snapper' needs a note. Captain Cook's official log for Friday 25 May 1770 notes that off Cape Capricorn there were caught 'some fish of the snapper kind;' Cook was familiar with the snapper (*Lutianus* and *Sebastes*) of the Atlantic coast of America, and saw in the new species some resemblance to those he already knew. The Australian fish's name was so spelt until 1830, but between then and 1850 the spelling was changed (it cannot be ascertained when or how) to 'schnapper;' since that time the latter spelling has been widely used. The correct spelling of the word is 'snapper,' and the *New Oxford Dictionary* is incorrect in saying that 'snapper' is obsolete in Australia and New Zealand.

Sneezeweed. See CENTIPEDA.

Snipes. See WADERS.

Snodgrass, KENNETH (1784-1853), born in Scotland in 1784, joined the army in 1802 as ensign of the 52nd regiment, saw service in the Peninsular war—where he led the forlorn hope at the siege of St. Sebastian—gained a military C.B., and was made lieutenant-colonel in 1817. For eight years he commanded a regiment, but in 1826 was disqualified by a severe wound from serving in the East or West Indies, then the most favourable sphere for military distinction; he therefore accepted an appointment as major of brigade to Governor Darling and reached Sydney during 1828. Darling liked him well, and on several occasions pressed his claims on the British government, but unsuccessfully; Bourke in 1834 renewed the pressure with a strong testimonial to his zeal, ability, and character, but without success. His work in New South Wales, apart from the sufficiently arduous duties of major of brigade, included superintendence of the colonial ordnance from 1829 onwards and of the mounted police in 1830-1. In November 1833, being senior military officer in the colony, he was appointed to the executive and legislative councils, in October 1836 sent to Tasmania to command the troops there and administer the government till the arrival of Sir John Franklin, and—having performed that duty 'to the perfect satisfaction of the inhabitants,' says Bourke—was in June 1837 nominated by that governor to be commandant at Port Phillip; nothing came of this. On 6 December 1837 he retired from both New South Wales councils to administer the colony in the interim between governors Bourke and Gipps, and fell foul of Dr. Lang over an act of council that stabilized the affairs of the Presbyterian Church in the colony without including Lang in the dominant presbytery. In 1840 he was voted £755 by the colonial legislature for his services in the early thirties, and in 1844 Gipps recommended him for a 'Local Order of Merit' suggested by the British government (this was afterwards merged into the already existing order of St. Michael and St. George). Snodgrass had by that time retired into private life on his Raymond Terrace estate, where he died on 14 October 1853.

Snow-flies. See HEMIPTERA.

Sobraon (ship). See NAVAL DEFENCE.

Societies, Learned. *The Royal Society of Tasmania.*—In 1839 Sir John Franklin, then governor of Tasmania, founded The Tasmanian Society, which had 33 resident and 39 corresponding members, held its meetings at government house, and during its existence published three valuable volumes of research-work—*The Tasmanian Journal*—to which John Gould and Joseph Hooker were contributors. Unfortunately the next governor, Sir John Eardley-Wilmot, on succeeding to the presidency of the society in 1843, insisted on changes in its constitution which drove the members to secede from the government-house connection, re-elect Sir John Franklin as president, and maintain a separate existence until 1848 with Launceston as head-

quarters. Eardley-Wilmot, for his part, founded a new society—the Botanical and Horticultural Society of Van Diemen's Land—for which in 1844 he obtained the title of 'The Royal Society of Van Diemen's Land for Horticulture, Botany, and the Advancement of Science.' This was the first Royal Society established outside the United Kingdom. To it Eardley-Wilmot entrusted the care of the Hobart botanical gardens.

In 1848 Governor Denison brought about an amalgamation of the rival societies, and inaugurated a library and museum. In 1855 'Tasmania' was substituted for 'Van Diemen's Land' in the title. In 1885 the museum and botanical gardens were handed over to the government, and in 1911 the society was incorporated. Since 1849 it has issued 64 volumes of *Proceedings*; it has 265 members on the roll, and a library of over 13,000 volumes.

The Royal Society of New South Wales.—In December 1821 Sir Thomas Brisbane, then governor of New South Wales, founded the Philosophical Society of Australasia. Though very short-lived—it seems to have died at latest early in 1823—this society left behind it two lasting memorials; a memorial to Cook and Banks, which its members affixed to Point Sutherland in Botany Bay on 20 March 1822, and a series of papers read at its meetings, which were included by Barron Field (q.v.) in his *Geographical Memoirs on New South Wales*. Field in 1825 wrote that the society 'soon expired in the baneful atmosphere of distracted politics, which unhappily clouded the short administration of its President.' For 28 years New South Wales contented itself with various agricultural and horticultural societies; but on 19 January 1850 Charles Nicholson (q.v.) and Henry Grattan Douglass—who had been secretary of Brisbane's society—founded the Australian Philosophical Society, with the object of encouraging such scientific research as should help to develop the colony's material resources. In June the name was altered to 'The Australian Society,' and at the end of August to 'The Australian Society for the Encouragement of Arts, Science, Commerce and Agriculture.' By 1855 this body also was dormant, and on 30 July of that year it was resuscitated by Sir William Denison as the Philosophical Society of New South Wales; Douglass was again one of the secretaries. The first formal meeting of the new body was held on 9 May 1856. It functioned steadily for some years, but by 1865 was in a 'languishing condition;' in November of that year it decided to change its name (if permission could be obtained) to 'The Royal Society of New South Wales.' Queen Victoria gave permission in September 1866, and the new title was assumed on 12 December of that year. Papers read before this series of societies were published in the Sydney *Magazine of Science and Art* up to 1859; in 1866 appeared a volume of *Transactions* covering the period 1862-5; and the Royal Society published *Transactions* in 1867-77 and a *Journal* annually since 1878. In 1875 the society acquired its own building in Elizabeth-street, Sydney, and was incorporated in 1881. In 1925 it had a membership of 375 and a library of over 30,000 volumes. Since 1878 it has awarded annually a Clarke medal (in memory of William Branwhite Clarke, q.v.) for meritorious work in geology, mineralogy, or natural history.

The Royal Society of Victoria dates from 1854, in which year were founded the Victorian Institute for the Advancement of Science, and the Philosophical Society of Victoria; these were amalgamated in the following year under the title of 'The Philosophical Institute of Victoria,' which in 1860 was changed to 'The Royal Society of Victoria.'

Up to 1925 71 volumes of its *Proceedings* (formerly *Transactions and Proceedings*) had been issued. The library contains over 12,000 volumes. In 1924 there were 197 members on the roll; the income and expenditure were respectively £668 and £414, the former including a government grant of £100.

The Royal Society of Queensland, inaugurated in 1884 under the presidency of Sir A. C. Gregory 'for the furtherance of the natural and applied sciences,' was shortly afterwards amalgamated with the Queensland Philosophical Society, founded in 1859. In 1925 the society had 180 members; the library contained 7000 volumes, and 36 volumes of *Proceedings* had been published.

The Royal Society of South Australia grew out of the Adelaide Philosophical Society, founded in 1853 to foster science, literature, and art; this in 1859 was incorporated with the South Australian Institute. Under Ralph Tate (q.v.) the society became purely scientific, and received its present name in 1890. In 1903 it was incorporated, and an endowment fund established, Sir Joseph Verco, Thomas Scarfe, and R. Barr Smith contributing £1000 each. Up to 1924 the society had issued 48 volumes of *Transactions* and six parts of *Memoirs*, exclusive of individual papers of early date. The roll contains 120 fellows or members. The library contains 4000 volumes and more than 1600 pamphlets.

The Royal Society of Western Australia evolved from the Mueller Botanic Society (founded in 1897), which changed its name to 'The Natural History and Science Society of Western Australia' before receiving permission to adopt its present title in 1914. In 1924 it had 253 ordinary or associate members. Eleven volumes of *Proceedings* were issued by the Natural History and Science Society and ten by the Royal Society. The library contains 200 volumes and 350 pamphlets.

The Australasian Association for the Advancement of Science.—On 1 August 1866 Professor John Smith, presiding at a meeting of the Philosophical Society of New South Wales, foreshadowed the creation of an Australian Association for the Advancement of Science; but it was not until 1884 that Archibald Liversidge (q.v.) revived the suggestion, and a meeting called by him on 10 November 1886 decided to form an Australasian Association on the lines of the British Association. The first meeting was held in Sydney on 28 August 1888. Meetings are held biennially in the chief towns of Australia and New Zealand—in Sydney (1888, 1898, 1911), Melbourne (1890, 1900, 1913), Adelaide (1893, 1907, 1924), Brisbane (1895, 1909), Hobart (1892, 1902, 1921), Christchurch (1891), Dunedin (1904), Wellington (1923), and Perth (1926). The Association's head office is at the Royal Society's House in Sydney, and there are branches in the six States and in New Zealand. The average annual membership is 700, including associate members who join for single meetings only. Among the presidents have been Baron von Mueller, Augustus Gregory, Sir Edgeworth David, A. W. Howitt, and Sir W. H. Bragg. After each meeting a *Report*

is published at the expense of the State or Dominion in which the meeting has been held. The Association awards from time to time a Mueller Memorial Medal for meritorious work connected with the natural history of Australia or New Zealand.

The Australian National Research Council.—At a conference held at the Royal Society's rooms in London, in October 1918, it was decided that an International Research Council should be formed, and certain countries were invited to participate. An invitation sent to Australia in 1919 resulted in the formation of the Australian National Research Council, which consists of not more than 100 members, and an unlimited number of associate members. Sir T. W. Edgeworth David was elected the first president. Its objects are:—(1) to represent Australia in the International Research Council; (2) to promote generally, as far as possible in co-operation with existing institutions, the cause of scientific research in Australia; and (3) to serve as an Australian National Academy of Science. The subjects represented are agriculture, anthropology, astronomy, botany, chemistry, economics and statistics, engineering, geography, geology, mathematics, mental science and education, meteorology, mining and metallurgy, pathology, physics, physiology, veterinary science, and zoology.

The Linnean Society of New South Wales.—This society was founded in 1874, the initiatory steps being taken by Dr. H. G. Alleyne and Captain Stackhouse, R.N. From the first its patron was Sir William Macleay (q.v.), who in 1874-85 made unrecorded but frequent payments towards its expenses, in 1885 gave it Linnean Hall in Elizabeth Bay as headquarters, and in 1890 made a donation of £14,000. In his will he left £6000 as a general gift, £12,000 for research in bacteriology, and £35,000 to found four Macleay fellowships; these are of the value of £400 a year, and are granted to graduates in science of the university of Sydney who are also members of the society—they are tenable for a single year, but renewable at the society's discretion. The average annual membershep is a little over 100, but in 1924 there were 172 members. Women have been admitted since 1909. Among the society's publications are the *Macleay Memorial Volume* (1893), *Historical Notes of the First Fifty Years* (1925), and 49 volumes of *Proceedings* covering the period up to the end of 1925. The original library was destroyed in the Garden Palace fire of 1882 (see EXHIBITIONS); the existing library contains 12,000 volumes.

The Victorian Zoological and Acclimatization Society originated in 1861. Under the zealous charge of Dr. Thomas Black as chairman, A. A. C. Le Souef as secretary, and its most prominent promoter Edward Wilson, it made rapid progress. Its most notable achievement has been the formation of the zoological gardens at Royal Park, which contain a remarkably fine collection of animals. See ZOOLOGICAL GARDENS.

The Royal Zoological Society of New South Wales originated in 1879 as a society for the acclimatization of song-birds and useful game. In 1880 it became the Zoological and Acclimatization Society, and by permission of the municipal council of Sydney established a depot at Moore Park, which in 1884 was opened as zoological gardens (q.v.). The maintenance of these gardens—which by 1915 covered 11 acres—constituted the society's chief work; when, however, the gardens were removed to Taronga Park and vested in trustees, the society (which was granted the addition 'Royal' in 1908) became a learned society for the study of Australian zoology and the publication of *The Australian Zoologist*. On 30 June 1925 the society had 400 members, of whom six were honorary.

The Royal Australasian Ornithologists' Union is a society interested generally in the avifauna of the Australian region and particularly in that of the Australian continent. The inaugural meeting was held in Adelaide in 1900. The council of 14 members contains at least one representative of each State. For 25 years the union has published quarterly *The Emu*, which, besides articles, includes photographs of Australian birds in the field. It is largely due to the efforts of the union that a wholesome public opinion concerning the export of Australian animals has been developed, and that increased protection of Australian birds is afforded by the customs department, assisted by the recommendations of an advisory committee in each State. An annual congress for discussion and field observation is held in each State in succession. The membership at the end of 1925 was about 550.

The Field Naturalists' Club of Victoria, founded in 1880 for the purpose of studying the fauna and flora of Victoria, has for 46 years held monthly meetings, fortnightly excursions, and annual exhibitions of wild flowers and other objects. Since 1884 the club has published the *Australian Naturalist*. The membership is over 300.

The Naturalists' Society of New South Wales was founded in 1900 to replace a Field Naturalists' Club. It publishes a quarterly journal, *The Australian Naturalist*, of which five volumes have appeared.

The Field Naturalists' Section of the Royal Society of South Australia was founded in 1883 by Professor Tate, to provide a recruiting-ground for the increase of the parent society. In 1924 there were 185 members on its roll. Lectures, excursions, and exhibitions of wild flowers and natural history objects have been held. Its quarterly journal, *The South Australian Naturalist*, has reached its fourth volume.

The Queensland Naturalists' Club was founded in 1906, by naturalists and teachers in Brisbane (led by Professor S. J. B. Skertchly) to study all branches of natural history, preserve the flora and fauna of Queensland, and encourage among children a spirit of protection towards native birds, animals and plants. The *Queensland Naturalist*, the club's journal, is issued in parts three or four times a year. The club possesses a small library. Its most important function is the annual wildflower show. The adult membership in 1925 was 124.

The Tasmanian Field Naturalists' Club was founded in 1905 'to promote wider interest in the study of Tasmanian natural history, particularly in the schools.' About 100 members are on the roll; it publishes *The Tasmanian Naturalist* quarterly, and the *Easter Camp Report* annually.

The Entomological Society of New South Wales was founded in 1862. For three years meetings were regularly held, but became more irregular until the final meeting in July 1873. Its members then joined the Linnean Society of New South Wales (see above). Two volumes of *Transactions* were published, each issued in five parts.

The Royal Australian Historical Society, originally named 'The Australian Historical Society,' was founded in 1901, and became 'Royal'

in 1918. The membership in 1924 was 875—including eight benefactors who had made substantial donations, and 17 fellows who had contributed to a knowledge of Australian history. Largely by reason of the A. G. Foster bequest a fund of £6000 is in hand towards the erection of a home and an historical museum for the society. At its instigation tablets have been placed on historic sites in Sydney and its environs, and (through representations to the federal government) in Queensland and Victoria. The society's *Journal* completed its 11th volume in 1925.

The Historical Society of Victoria was established in May 1909, and in December 1920 absorbed the Victorian branch of the Royal Geographical Society of Australasia. Its membership in 1925 was 233. Since January 1911 it has published the *Victorian Historical Magazine*, which has now completed its tenth volume. The society has also formed an extensive collection of books, pamphlets, maps, engravings, and photographs connected with Australian history, and has been instrumental in erecting several mural tablets and other memorials. An endowment fund, established in 1914 for ensuring the permanence of the society's activities, has now some £230 to its credit.

Branches of the *British Astronomical Association* exist in most of the States. (See ASTRONOMY).

The Microscopical Society of Victoria was founded in Melbourne in 1908 for 'the promotion of all branches of microscopy, to associate its members for mutual assistance in all matters pertaining thereto, and to stimulate microscopical research generally.' An earlier society of the same name was founded in Melbourne in 1873, flourished for about ten years, and then became affiliated to the Royal Society of Victoria. In 1912 the society published its first *Proceedings*. It has received many donations, including the fine cabinet of slides and library of the late J. Wedeles. It has a membership of 78.

H.J.C.

Soils may be classified in several ways: the most generally useful takes into account their mechanical condition, i.e. the amount of clay and sand they contain. The mechanical scheme best suited to Australian conditions is the following:—

	Sand
Clay	0–25 per cent
Heavy loam	25–40 „ „
Loam	40–60 „ „
Light Loam	60–70 „ „
Light sandy loam	70–90 „ „
Sand	90–100 „ „

Calcareous soils contain over 5 per cent of lime.
Peaty soils contain over 15 per cent of humus.
Stony soils contain over 10 per cent of stones.

All the above types are represented in Australia, though there are few calcareous soils or marls except in South Australia. A classification based on the rock from which a soil is derived is also frequently of value, especially where the rock has weathered in situ, forming a 'residual' soil; soils that have been washed or blown away from their original location are said to be 'transported.' A geological scheme would separate

(*a*) those derived from igneous rocks, such as granites and basalt
(*b*) those derived from metamorphic rocks, such as slates and schist
(*c*) those derived from sedimentary rocks, such as sandstones, shales, and limestones.

The following table gives the average chemical composition of typical soils derived from different rocks:—

	Volatile matter	Nitrogen	Lime	Potash	Phosphoric Acid
Granite	6	0.13	0.15	0.17	0.16
Basalt	7	0.25	0.4	0.12	0.2
Sandstone	7	0.13	0.1	0.07	0.14
Shale	6	0.1	0.13	0.06	0.11
Limestone	9	0.13	0.8	0.26	0.13
Alluvial plains, coastal	8.4	0.13	0.8	0.17	0.25
black-soil	7.4	0.09	0.67	0.34	0.18
Alkaline	6	0.03	0.7	0.35	0.05

The composition of *granite* soils varies according to their derivation from acid granites (containing over 75 per cent of silica) or from basic granites (65 to 75 per cent of silica). Their lime and potash contents are largely determined by the nature of the felspar (whether orthoclase, oligoclase, or anorthite). These soils vary from light sandy loams to loam. The subsoils are usually more or less clayey, the surface soil usually loose and porous; leaching therefore takes place freely, and granite soils are as a rule low in plant-food, but generally well-drained and aerated. The more basic granites usually contain higher proportions of lime and potash. Granite soils are likely to be low in humus-content.

Basalt contains no quartz, weathers rather rapidly, and is well supplied with lime, so that soils derived from it are usually of a friable, clayey character, rich in humus, well-drained and warm, and of a darker colour than granite soils. Nitrification is generally active. The surface soil is deep, reddish to black; the subsoil is more clayey, and, when the drainage is defective, may be very stiff. The darker soils formed by *slates* and *schists* usually contain chlorite and hornblende; these contain a fair proportion of lime, and are friable, whereas the lighter-coloured soils, rich in silica and alumina, are usually stiff and have clay subsoils. The dark soils are also richer in phosphoric acid and humus. Nearly all the slate and schist soils of New South Wales, being derived from rocks consisting largely of silica and alumina, are comparatively poor.

The determining factor in the composition of *sandstone* soils is the nature of the cementing material, which may be either clayey or calcareous. The Hawkesbury sandstone, for example, is a siliceous sandstone, containing alumina and iron hydrates; its soils are for the most part light sandy loams, porous, often of fair depth, always poor in plant-food, and with low humus-content and water-holding power. Many of them are cold and sour. Typical *shale* soils in chemical composition resemble sandstone soils. Shale readily weathers, and the result is usually clayey or loamy; the soils are therefore as a rule shallow, with stiff clay subsoil (occasionally pipe-clay), deficient in humus, lacking porosity, poor in plant-food, and liable to set hard.

Limestone soils are naturally rich in lime, the exact content depending upon the amount of weathering and leaching they have undergone; limestone is readily attacked by weathering agencies. Generally speaking, the soils are deep heavy loams, rich in plant-food, dark in colour, warm, and fertile.

Alluvial soils are 'transported,' and may be the product of several rock-formations, so that their chemical composition varies considerably. They are usually deep loams or heavy loams, with a high water-holding power, rich in humus

and in mineral plant-food (especially lime and potash), and invariably fertile. The 'black-soil plains' of the inland areas are good wheat-land, but, should they be alkaline in character, are hard to cultivate. Red-soil plains are similar in character, but usually less rich in plant-food, and of varying depth.

Typical *alkali* soils are met with in the United States, but some Australian soils are alkaline in character. Alkali (carbonate of soda) in the soil burns out the vegetable matter and forms a cementing material; this binds the soil-particles, and finally renders the surface so hard that on drying it cracks and cannot be opened up by the plough. This is particularly likely to happen when the soil is irrigated, as the alkali is brought up under irrigation from the subsoil and deposited on the surface. When the water used for irrigation is itself alkaline (as is much artesian bore-water), the danger is intensified. Alkaline soils are nearly always extremely rich in mineral plant-food, though comparatively poor in humus and nitrogen; they are, therefore, extremely productive when maintained in good tilth, especially if it is possible by draining to keep the level of the water-table three to four feet below the surface. Not only does alkali destroy the texture and harden the soil in the manner described, but the alkali-laden water, rising by capillarity, evaporates and leaves a deposit which injures the plants. Similar damage is done if badly drained land is flooded with alkaline water. Good results have followed applications of powdered gypsum (q.v.) to the soil or to the water used for irrigating.

Another classification takes into account the suitability of certain soils for typical crops. Omitting the variable chemical composition, the following have been found typical characteristics of soils on which certain crops are most successfully grown. A typical wheat-soil is loamy, more or less reddish in colour, fairly rich in mineral plant-food, but usually rather low in humus and water-holding capacity. It requires little other manuring than a small dressing of superphosphate (see MANURES). A typical maize-soil is a loam, generally well supplied with humus but low in mineral plant-food, particularly in lime and potash. A typical soil from localities where the best lucerne is grown is a deep, rich alluvial, loamy in character, particularly rich in lime (the presence of which is essential). The subsoil is open, porous, and generally of considerable depth. A typical potato-soil is a fairly rich, friable loam (or light loam), well supplied with humus nitrogen and mineral plant-food, though not necessarily rich. The typical vineyard-soil of the Hunter River is a light loam, fairly well supplied with mineral plant-food (particularly lime), but generally poor in humus and nitrogen. Vineyard-soils in the Albury district are of a heavier type, running from loams to heavy loams. The soils best adapted for orchards are loams (or light loams) of good depth, open and easily worked. Citrus fruits can be grown on comparatively poor soils which, with proper manuring and cultivation, can be converted into fertile soils, especially if plenty of vegetable matter is added.

What may be called the 'bushman's classification,' depending upon the nature and extent of the timber and herbage, is generally useful in estimating the potential value of land, but possesses only local significance. Land is under this scheme classified as timbered, plain, or open country, grazing-land, pine-, box-, brigalow-, or ironbark-country, and so on. A short account of what is known in this connection has been given in H. Jensen's *The Soils of New South Wales* (Sydney, 1914). See HUMUS.

F.B.G.

Solanaceae, a large family of herbs, shrubs, or soft-wooded trees found chiefly in warm and tropical countries. Nine genera, including 79 species, are indigenous to Australia. The flowers are frequently solitary; fruit a dry capsule or succulent berry. *Physalis* is most abundant in America. The only species indigenous to Australia, *P. minima,* ranges from New South Wales to northern Australia, and extends to most tropical countries. It has the angular fruit, calyx, and globular berry of its relative *P. peruviana,* the Cape Gooseberry. The fruit is eaten by the Cloncurry natives, who call the plant 'neen-guan.' *Anthocercis* has 17 endemic species, found chiefly in Western Australia; most are shrubs with white or yellow flowers, the corolla-tube streaked inside with purple or green. Several are highly ornamental shrubs. An introduced species of this family, the Trumpet Flower (*Solandra laevis*), has in its sap an alkaloid which, like atropine and duboisine, temporarily paralyses the accommodation of the eye, and must therefore be handled with caution. See DUBOISIA, NICOTIANA, and SOLANUM.

Solander, DANIEL CARL (1736-1782), born in Norrland, Sweden, in 1736, was a pupil of the renowned Linnaeus at the university of Upsala (M.B., 1759), and in July 1760 came to London with strong recommendations from his master. In 1762 he was offered the professorship of botany at the academy of sciences at St. Petersburg, but preferred to stay in England, where he arranged a museum for the Duchess of Portland, catalogued some of the natural history collections in the British Museum, and in 1763 was appointed assistant-librarian there—in which capacity he familiarized English botanists with the Linnean system of classification. In 1768 Joseph Banks (q.v.) engaged him at £400 a year to join the party of scientific observers who were to accompany Captain Cook, and he utilized the opportunity to make extensive collections of South Sea and Australian plants. When in 1771 the *Endeavour* returned to England Banks established Solander in his house at Soho-square, London, to describe the newly discovered flora; in the following year he accompanied Banks to Iceland, and in 1773 was made keeper of the printed books in the British Museum. He died of apoplexy in Soho-square on 16 May 1782. Among other scientific distinctions he was made a fellow of the Royal Society of London in 1764, and a D.C.L. of Oxford in 1771. Many of his unpublished manuscripts are in the British Museum.

Solanum, a large genus of the family Solanaceae, consisting of herbs or shrubs, widely dispersed, but most abundant in tropical America. Fifty-six species are indigenous to Australia; they have blue, purplish, or white flowers and succulent fruits. *S. aviculare* (Kangaroo Apple, the 'gunyang' of the Victorian aborigines), ranges almost across the continent. The fruits, when perfectly ripe, burst their outer skin, and may then be eaten raw, boiled, or baked. The fruit has a mealy, sub-acid taste when cooked; if eaten unripe, it is acrid and causes a burning in the throat. The berries of *S. hystrix* (the 'walga' of South Australian aborigines) are used as a food in conjunction with the pounded bark of mallee roots; the

natives take off the outer coat (the dry prickly calyx) of the fruit, and remove the seeds, leaving a pulpy skin, which is mixed with the bark and made into a cake. The fruits of *S. esuriale*

Kangaroo Apple.

are eaten by inland natives. Those of *S. simile* have a scent distantly reminiscent of strawberries. Sheep eat the foliage of both *S. simile* and *S. eremophilum*. The berries of several species are, upon somewhat doubtful evidence, reputed to be poisonous.

Soldier. See FORTESQUE.

Soldier-bird. See MINERS.

Soles (Soleidae), along with their allies the flounders (q.v.), differ from all other fishes in having both eyes on the same side of the head. In the larval stages the body is bilaterally symmetrical; but at a very early period of growth the young fish falls over to one side, and the lowermost eye then moves towards its fellow either by twisting the cranium or by passing through it to the other side. A greatly flattened body is another developmental feature of the group, the larva having the slender form of other fishes. In adults usually only the upper side, which bears the eyes, is coloured, the lower being more or less white; but ambicoloured specimens, having the lower surface wholly or partly coloured like the upper, are not rare. A few species have the eyes and coloration either on the right or left side indifferently, but the rule is that some genera have the right side uppermost and others the left; abnormal individuals are occasionally found.

By fishermen soles and flounders are commonly confused, both names being indiscriminately applied to allied fishes; some species, such as *Ammotretis rostratus*, are known as 'soles' in one State and as 'flounders' in another. A distinguishing feature is afforded by the preoperculum, which has its margin free and exposed in the flounders, whereas it is hidden beneath the skin in the soles. A considerable number of soles occur in Australian waters, but few are common, and only a small number find their way into the markets. The Black Sole (*Synaptura nigra*), the species usually offered for sale in Sydney, is a fleshy and fine food-fish, attaining a length of 14 inches. It is found on sandy and muddy flats, where it lies almost completely buried, with only eyes and mouth protruding. Tongue soles (*Paraplagusia*) are also occasionally exhibited for sale, but are less popular on

Black Sole.

account of their smaller size. The zebra soles (*Zebrias*), peacock soles (*Pardachirus*), and banded soles (*Aseraggodes*) are highly ornate, with striking colours and variegated patterns, but are too small to be of economic importance.

A.R.McC.

Song-larks, two species of anomalous birds peculiar to Australia, whose classification is very uncertain. They have been placed by different writers among the Motacillidae (pipits), Sylviidae (warblers), and Timaliidae (babblers).

The male Brown Song-lark (*Cinclorhamphus cruralis*) is a bird about nine inches in length, dull-brown above and blackish below; the female

Rufous Song-lark (*length 7 in.*).

is very much smaller. The Rufous Song-lark (*C. mathewsi*) is seven inches long, brown above, with a rufous patch at the base of the tail, and whitish below. In habits they greatly resemble

the true larks (Alaudidae), running on the ground and rising into the air to pour forth a melodious song while soaring upwards, but they also sing while perched in trees or flying from one tree to another. The nest of dry grass is built on the ground in the shelter of a tussock; four eggs are laid, the ground-colour of which is white, almost obscured by reddish and purplish freckles.

Both species are found all over the continent (mainly inland). Neither extends to Tasmania. They are more or less migratory, leaving the southern districts in the winter; but their movements are erratic, and their numbers vary greatly in any district in different seasons.

W.B.A.

Sophora, a large tropical genus of the family Leguminosae, consisting of trees and shrubs. A few species are found outside the tropics, in New Zealand and southern Chile. The flowers are white or yellow, rarely violet; pods moniliform, i.e. constricted between the seeds, so as to resemble a necklace of beads; leaves with numerous leaflets. *S. tomentosa* (Sea-coast Laburnum) is a tropical maritime shrub. The New Zealand species are highly ornamental.

Sorell, WILLIAM (1775-1848), born in England in 1775, entered the army in 1790 (ensign, 1790; lieutenant, 1793; captain, 1795; major, 1804; lieutenant-colonel, 1807), and saw active service in the West Indies, Holland, and Spain. In 1807 he was appointed deputy adjutant-general at the Cape of Good Hope, and held the position until 1811. Returning then to England, he left the army in 1813, and on 3 April 1816 was made lieutenant-governor of Tasmania in succession to Thomas Davey (q.v.). He took charge of the colony on 9 April 1817, and for seven years administered the government with great ability and vigour. When he arrived the island was overrun by gangs of bushrangers, of whom the most noted was 'Black' Michael Howe (q.v.). Sorell suppressed these gangs with the help of substantial rewards for the killing or capture of the bushrangers. In the later years of his rule, however, bushranging prevailed again on an even greater scale, with Matthew Brady as the chief leader. The colony was further vexed by the outrages of the Oyster Bay tribe of aborigines, led by Musquito (q.v.), an aboriginal from the mainland. Sorell encouraged the immigration of free settlers, and under him both the pastoral and farming industries flourished; Tasmania exported cattle and sheep to the Mauritius, and wheat to Sydney and Brazil, and the export of wool began. The main road between Hobart and Launceston was in the main constructed under Sorell's orders. He also strongly advocated the establishment of criminal and superior civil courts in Tasmania, tightened up the happy-go-lucky system of convict control which had prevailed under Davey, and for incorrigibles established a penal settlement (called 'hell' by the convicts) at Macquarie Harbour. So impressed was Commissioner Bigge by Sorell's gaol regulations, and by his system of passes for and registration of convicts, that he recommended their introduction into New South Wales. Sorell had been separated from his wife as far back as 1807, and the irregularity of his private life gave those who for other reasons disliked him an opening for damaging attacks. Consequently Bigge was instructed by the colonial office to make particular enquiry into the allegations of immorality, most of them made by Sorell's bitter enemy Anthony Fenn Kemp; and, though he found Kemp's stories greatly exaggerated, the gist of them—that Sorell lived with another man's wife, who was treated both by him and by the majority of free residents in Hobart as his own wife—could not be gainsaid. In spite, therefore, of Bigge's own testimony to Sorell's 'great and distinguished merit' and of strongly worded resolutions passed by the citizens of Hobart against any recall of a governor whose 'union of wisdom and experience . . . is most essential to our general and individual interests,' Bathurst on 26 August 1823 notified Sorell of his dismissal, carefully attributing it only to the private reason mentioned above. Every other charge brought against him had been either disproved or satisfactorily explained, and his public record stands high in the history of Tasmania. His report on the state of the colony, addressed to Arthur on 22 May 1824, is one of the most creditable documents ever written by an Australian official.

On 14 May 1824 Sorell handed over the government to Arthur, and on 12 June departed for England, where he spent the rest of his life in quiet on a then unprecedented pension (for a colonial lieutenant-governor) of £500 a year—a sure token that Bathurst valued his work highly and regretted his dismissal. He died on 4 June 1848.

T.D.

Sorghum and Millet. A variety of sorghum known as 'Caffre corn' was introduced into Australia from The Cape Colony in the early years of the settlement, its grain being used for food. As the area under wheat extended, poorer food-grains went out of use. In 1858 the sugar-producing *Sorghum saccharatum* was introduced into New South Wales in the hope that in cool climates it might take the place of sugar-cane, but all efforts to produce granulated sugar from it were unsuccessful. Many varieties, both saccharine and non-saccharine, are now grown for green fodder, especially in districts too dry for maize; being perennial, they may be cut several times in a year. In 1889 the New South Wales department of agriculture imported seed of 54 varieties from India and cultivated them at its experimental farms; those now most in use (besides *S. saccharatum*) are Amber Cane, Planters' Friend, and Johnson grass.

The infrequent but undoubted poisoning of stock by Johnson grass has been discussed by H. Wenholz in the New South Wales *Agricultural Gazette* for February 1922. The grass contains a glucoside, dhurrin, from which prussic acid is liberated by an enzyme with the aid of animal digestive juices. Provided that the whole amount of acid were set free in the animal's stomach, 7½ lb. of fresh young sorghum would be a poisonous dose, but conditions are always against complete liberation of the acid. When the grass is allowed to wilt, or made into hay, the necessary enzyme is apparently destroyed and no prussic acid is formed. On the other hand, Johnson grass that has been injured by drought or frost has more than the normal supply of the acid. Further, climate affects the amount of acid, farmers in the north coast districts of New South Wales being less troubled with sorghum poisoning than those in colder or less fertile districts.

The remedies recommended for sorghum poisoning are (*a*) a hypodermic injection of

sulphuric ether—dose for an ox, 10 cubic centimetres; (*b*) a mixture, made immediately before administering, of 1 oz. carbonate of soda dissolved in 1 pint of water and ½ oz. sulphate of iron dissolved in 1 pint of water—in this case the dose is, for a cow, 1 quart of the mixture; for a sheep, 1 pint.

Broom millet is cultivated for its fibre in three States. In 1924-5 1301 acres were laid down in it in New South Wales (chiefly in the Hunter River valley and the south coast district), 531 in Victoria, and 554 in Queensland. Millet is also grown as a green-fodder crop in several parts of Australia, but separate statistics are not obtainable. For the native millet see GRASSES.

F.B.G.

Sorrel. See NOXIOUS PLANTS.

Soudan Contingent. See SUDAN CAMPAIGN, THE.

Sour Gourd. See ADANSONIA.

South Africa, AUSTRALIAN FORCES IN. When the war between Britain and the two Dutch South African republics broke out in October 1899 Australia was still politically a collection of six separate colonies, owning a common allegiance only to the Crown. Each province lit its own coasts, collected its customs, managed its postal affairs, and arranged for its defence as if every one of its five sisters was a foreign and possibly hostile power. Though federation was imminent, sentiment alone bound together communities which rather liked to regard themselves as of different characters. Conferences were sometimes held between heads of governments and departments, and agreements were made, but every colony was fiercely jealous of its independence. In matters of defence—except in the connection maintained by the royal navy—the colonies had nothing in common, save when they might combine to discuss general matters of mutual interest or to secure the services of an officer of the imperial army as an adviser on some question of fortification or military engineering. The organization of land defences was entirely local. It is necessary to remember this when considering the despatch of Australian troops to South Africa during the first period of the 2½ years of the war (see MILITARY DEFENCE).

The negotiations between the British government and that of the South African republic which, in the last quarter of the year, were to result in war with both the Transvaal and the Orange Free State, had been followed with intense interest in Australia. It was generally recognized that war was inevitable. As early as 11 July 1899 the government of Queensland made an offer, in the event of hostilities breaking out, of 250 mounted infantry with machine-guns. On the following day the governor of Victoria (Lord Brassey) cabled to the secretary of state for the colonies (Joseph Chamberlain) that citizens of that colony were offering themselves for service in South Africa, and a week later Earl Beauchamp informed him that in New South Wales 1860 officers and men had notified their willingness to serve if required.

The outbreak of war was the signal for enthusiastic volunteering throughout the continent. In every district members of the various defence units, as well as civilians, offered their services to the Empire, and in the first year and a half of the war the following quotas of men and horses were sent from the several colonies. Under the heading of 'regular troops' are included those who had been previously enrolled in either permanent or partly paid corps. The Bushmen were mostly recruited from hitherto untrained sources, though they were largely officered by men who had had some previous experience of military work.

Colony.	Regular Troops.		Bushmen.		Total.	
	Men.	Horses.	Men.	Horses.	Men.	Horses.
New South Wales	1,364	1,193	1,280	1,353	2,644	2,546
Victoria	514	447	905	1,135	1,419	1,582
Queensland	417	458	705	918	1,122	1,376
South Australia	245	156	330	397	575	553
Western Australia ...	233	255	242	267	475	522
Tasmania	127	4	175	188	302	192
Total.....	2,900	2,513	3,637	4,258	6,537	6,771

The total number of troops sent from Australia between October 1899 and the end of the war in June 1902 was 16,632.

Small as was the force contributed by the British colonies throughout the world, the effect of its being offered was very great. It gave the home government a moral support in face of both the hostility of Europe—notably of France and Germany—and the clamour of anti-imperialists in England. Materially considered, it nearly doubled the mounted troops at the disposal of Lord Roberts, and made possible the wide cavalry flanking movements which were the determining factor in the relief of Kimberley and the subsequent advance upon Bloemfontein and Pretoria. When their usefulness had been tested in the front line, it was ungrudgingly admitted that the contingents from Australia stood second to none, whether for efficiency or for mobility. Perhaps no other troops had lived under conditions so similar to those of the Boers, or knew better how to campaign in a country of such wide distances and so lacking in natural resources as South Africa.

A conference of the military commandants of the different colonies was held in Melbourne on 28 September 1899, and a scheme was agreed upon for sending a joint contingent, to number 2500 of all arms, rather more than half of which was to be mounted. But England did not yet realize the value of the Australian colonies as reservoirs of cavalry and mounted infantry. The plan of the commandants was superseded after the receipt of the famous telegram of 3 October from the secretary of state for war (Lord Lansdowne), which included the following words: 'Firstly, units should consist of 124 men; secondly, may be infantry, mounted infantry, or cavalry; in view of numbers already available, infantry most, cavalry least serviceable.' To some extent this message was regarded as a snub, though it does not appear to have been meant as such. But there can be no doubt that at first the war office was disposed to accept troops from the colonies rather as a compliment to the spirit which prompted their offer than with any notion that they could have a value equal to, or —as events proved—greater than, that of imperial regulars in such a war. This impression was soon corrected when the fighting had actually begun and colonial troops had been given an opportunity of proving their mettle. 'All the colonials did extremely well,' said Lord Roberts

afterwards. 'They were very intelligent; and they had, what I want our men to have, more individuality. They could find their way about the country far better than the British cavalryman could do.'

However, the Australian governments reluctantly assented to the British scheme, and the commandants proceeded to make arrangements for the organization and despatch of their respective units. Between 28 October and 5 November (war had been begun by the Boers on 11 October) the first Australian contingents sailed. They consisted of troops as shown in the following table (the detachment of lancers sailed from England, having been at Aldershot undergoing a course of training before the outbreak of war):—

New South Wales.	
Lancers	1 squadron
Infantry	1 unit
First Australian Horse	1 troop
Army medical corps	6 officers, 80 other ranks
Queensland.	
Mounted rifles	2 companies
Victoria.	
Mounted infantry	1 unit
Infantry	1 unit
South Australia.	
Infantry	1 unit
Western Australia.	
Infantry	1 unit
Tasmania.	
Infantry	80 men

Total about 1200 men, all arms.

The infantry were all eventually mounted in South Africa. The selection of these troops was made from an overwhelming number of applicants.

Further contingents were despatched throughout the war by the various State governments and, after federation, by the Commonwealth. Whenever possible, members of local defence forces were encouraged to enrol by receiving preference to other citizens. In many instances whole squadrons and other sections of partially or fully paid regiments volunteered. Whereas the earlier troops were officered by men of ordinary military knowledge, later troops had the advantage of being under the command of officers who had gained experience in South Africa itself. Early in 1900 the *Citizens' Bushmen* contingents were raised by public subscription as the result of a similarly successful citizens' movement in Canada. As every man was to be one acquainted with bush life, it was thus expected that the force would play an important rôle in coping with the guerilla methods of the enemy. In the second year of war, in response to an invitation from the Imperial government, the *Imperial Bushmen* were organized. They were to be subject entirely to Imperial command, and to serve directly under it. Pay was issued by the colonies at English cavalrymen's rates. In November 1899 the *Australian Regiment* was formed at Cape Town by the amalgamation of companies from Victoria, South Australia, Western Australia, and Tas-

UNITS SENT BY STATES, DISPOSAL OF ARMS, AND SAILING DATE OF CONTINGENTS.

Date.	Contingent.
	New South Wales.
9 Oct., 1899	Lancers.
28 Oct., 1899...	Army Medical Corps and Lancers (draft).
3 Nov., 1899...	"A" Squadron Mounted Rifles and Infantry.
14 Nov., 1899...	First Australian Horse.
30 Dec., 1899...	"A" Battery, Royal Australian Artillery.
17 Jan., 1900...	"B," "C," and "D" Squadrons M.R., Squadron F.A.H., and Lancers.
16 Feb., 1900...	Lancers (draft).
28 Feb., 1900...	Citizens' Bushmen.
23 April, 1900...	Imperial Bushmen.
15 Mar., 1901...	2nd M.R., "B" and "D" Squadrons 3rd M.R., and Artillery details.
21 Mar., 1901...	"A" "C," and "E" Squadrons 3rd M.R., and draft 2nd M.R.
5 April, 1901...	3rd M.R. (draft).
11 Feb., 1902...	A.A.M.C.
18 Feb., 1902...	1st Australian Commonwealth Horse.
1 April, 1902...	3rd A.C.H.
10 May, 1902...	
22 May, 1902...	5th A.C.H.
	South Australia.
28 Oct., 1899...	Infantry.
2 Nov., 1899...	1st M.R.
26 Jan., 1900...	2nd M.R.
27 Feb., 1900...	3rd Bushmen.
1 May, 1900...	4th Imperial Bushmen.
9 Feb., 1901...	5th I.B.
6 April, 1901...	6th I.B.
11 Feb., 1902...	Army Medical Corps.
20 Feb., 1902...	2nd Australian Commonwealth Horse.
1 April, 1902...	4th A.C.H.
26 May, 1902...	8th A.C.H. and Staff.
	Tasmania.
28 Oct., 1899...	Infantry.
23 Jan., 1900...	Mounted Infantry.
5 Mar., 1900...	Bushmen.
26 April, 1900...	1st Imperial Bushmen.
27 Mar., 1901...	2nd I.B.
16 Feb., 1902...	"E" Company 1st Australian Commonwealth Horse.
8 April, 1902...	"E" Company, 3rd A.C.H.
21 May, 1902...	"C" Squadron, 8th A.C.H.
	Special Service Officers.
	Battalion Staff, A.C.H.

Date.	Contingent.
	Victoria.
28 Oct., 1899...	Mounted Rifles and Infantry.
13 Jan., 1900...	2nd M.R.
10 Mar., 1900...	3rd Bushmen's.
1 May, 1900...	Imperial Bushmen.
15 Feb., 1901...	5th M.R.
12 Feb., 1902...	2nd Battalion Australian Commonwealth Horse.
12 Feb., 1902...	A.A.M.C.
26 Mar., 1902...	4th Battalion, A.C.H.
19 May, 1902...	6th Battalion, A.C.H.
	Special Service Officers.
	Battalion Staff, A.C.H.
	Queensland.
1 Nov., 1899...	1st Queensland Mounted Infantry.
13 Jan., 1900...	2nd Q.M.I.
1 Mar., 1900...	3rd Q.M.I.
18 May, 1900...	4th Queensland Imperial Bushmen.
6–10 Mar., 1901	5th Q.I.B.
4 April, 1901...	6th Q.I.B.
20 Aug., 1901...	Details 6th Q.I.B.
26 Sept., 1901...	Details 6th Q.I.B.
18 Feb., 1902...	"D" Company, 1st Australian Commonwealth Horse.
11 Feb., 1902...	Details, A.M.C.
25 Mar., 1902...	"D" Company, 3rd A.C.H.
19 May, 1902...	7th A.C.H.
	Special Service Officers.
	Staff A.C.H.
	Western Australia.
28 Oct., 1899...	Infantry.
7 Nov., 1899...	1st Western Australian Mounted Infantry.
3 Feb., 1900...	2nd W.A.M.I.
13 Mar., 1900...	3rd Bushmen.
8 May, 1900...	4th W.A.M.I.
6 Mar., 1901...	5th W.A.M.I.
10 April, 1901...	6th W.A.M.I.
26 Feb., 1902...	"E" Company 2nd Australian Commonwealth Horse.
26 Feb., 1902...	A.A.M. Corps.
7 April, 1902...	"D" Company, 4th A.C.H.
2 June, 1902...	"D" Squadron, 8th A.C.H.
	Battalion Staff, A.C.H.

mania; this was the first regiment formed as jointly representative of the various colonies. After a short service, however, it was absorbed (February 1900) in the 1st mounted infantry brigade, then under command of Major-general Hutton (q.v.).

When the Commonwealth had been established and the Australian defences transferred from individual colonies, it was decided to send further contingents of mounted rifles to South Africa, and to form battalions of a representative character with squadrons from each State. The battalions were first known as '—Battalion Commonwealth Contingent,' but subsequently as '—Battalion Australian Commonwealth Horse.' Army medical forces sent after federation were also designated with the prefix of 'Commonwealth.'

TOTAL STRENGTH OF AUSTRALIAN FORCES SENT TO SOUTH AFRICA 1899 TO JUNE 1902.

State.	State Troops at State Expense.			State Troops at Imperial Expense.			Commonwealth Troops.			Total.		
	Officers.	Other Ranks.	Horses.	Officers.	Other Ranks.	Horses.	Officers.	Other Ranks.	Horses.	Officers.	Other Ranks.	Horses.
New South Wales	160	3,217	3,135	76	1,308	1,443	78	1,271	1,294	314	5,796	5,872
Victoria	47	751	830	77	1,569	1,877	69	1,052	1,118	193	3,372	3,825
Queensland	39	694	868	73	1,346	1,603	37	699	736	149	2,739	3,207
South Australia	20	326	258	46	644	696	23	467	490	89	1,437	1,444
Western Australia	18	331	269	34	540	608	15	291	306	67	1,162	1,183
Tasmania	6	173	58	17	358	422	13	290	303	36	821	783
Total	290	5,492	5,418	323	5,765	6,649	235	4,070	4,247	848	15,327	16,314

The special service officers, with the sanction of the Imperial war office, were not detailed to contingents, but were employed independently either in staff employ, or with columns as directed by the commander-in-chief.

It is not possible to give in the compass of this article an account of the services and actions in which the several Australian forces participated, since (unlike the Australian Imperial Force in the war of 1914-18) the units for the most part acted independently and were scattered over a vast front. Each arm carried out its particular duties in a manner generally satisfactory, and in scouting and reconnaissance the Australians were found to be superior to any other troops at the front. As fighters, the reputation which they achieved in South Africa was quite in keeping with that won by the A.I.F. in the greater war. One incident may be quoted as an instance of unsurpassed courage and staying power. On 4 August 1900 General De la Rey attacked at Brakfontein, on the Elands River in the western Transvaal, a position occupied by a mixed force of about 500 men (mainly New South Wales, Queensland, Victorian, and Rhodesian bushmen), who had a 7-pounder m.l. screw-gun and two maxims. The Boer force consisted of upwards of 3000 burghers, with five guns, three 'pom-poms' (Vickers-Nordenfelt), and one maxim. For 11 days the little garrison (which was guarding a supply depot) withstood the attack, during which time 1800 shells fell within its laager. The river was half a mile away, and every drop of water had to be carried thence to the trenches under a heavy and accurate fire. On the first day of the siege all the horses and transport animals were killed by shell-fire and lay putrefying the whole time until the gallant handful were relieved. The stench and flies were frightful. After four days of bombardment De la Rey offered the garrison all the honours of war, including the retention of their arms, and a safe-conduct to the nearest British port, if they would surrender. It is said that his note was sent back to him endorsed 'If you want the supplies we are guarding, you must come and get them.' 'Every soldier who saw the place afterwards,' says the principal English historian of the war, 'expressed surprise that they could have held out so long, and it is, therefore, the more creditable to them to have done so when every hope of relief seemed entirely cut off; while, at a time when surrenders and retreats were not sufficiently rare, the example shown by these splendid men was even more important than the position they held.'

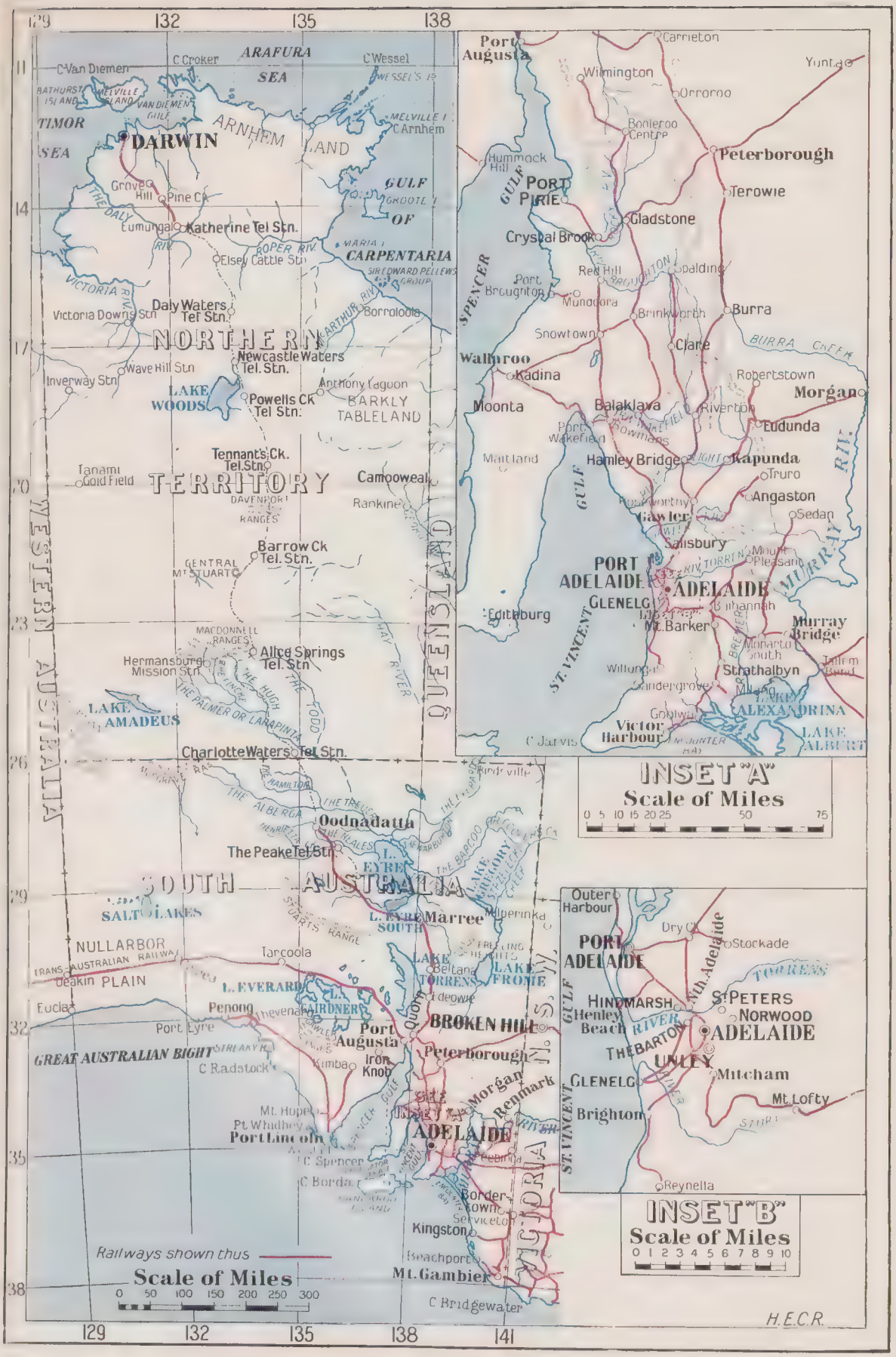
CASUALTIES OF AUSTRALIAN FORCES.

	Officers.	Other Ranks.
Killed and died of wounds	29	222
Deaths from disease	9	258
Wounded	77	658
Missing and prisoners	5	142
Total	120	1,280

The best books on the campaign are *The Times History of the War in South Africa* (London, 1900-9); Doyle's *Great Boer War* (London, 1902); Wilkinson's *Australia at the Front* (London, 1901); and Abbott's *Tommy Cornstalk* (London, 1902).

J.H.M.A.

South Australia, bounded on the east and west by the 141st and 129th meridians of east longitude, on the north by the 26th parallel of latitude, and on the south by the Southern Ocean, has an area of 380,070 square miles; its extreme southerly limit is in about 38° S. lat. where the coast-line joins that of Victoria. The geographic features are described under GEOGRAPHY, ECONOMIC. The coast-line was first sighted in 1627, when the *Gulden Zeepaert*, commanded by Francois Thyssen and having as passenger Pieter Nuyts (see AUSTRALIA, DISCOVERY OF), coasted from the westwards as far as Nuyts' Archipelago, the two largest islands of which were named St. Peter and St. Francis. Nothing more was known of the coast-line until 1800, when James Grant (q.v.) in the *Lady Nelson* made his landfall there and named Cape Northumberland, Cape Banks, Mount Schanck, and Mount Gambier. In 1802 Matthew Flinders (q.v.) in the *Investigator* made a detailed study of the coast from Fowler's Bay to Encounter Bay, naming among other outstanding physical features Port Lincoln, Spencer Gulf, Kangaroo Island, St. Vincent Gulf, Yorke Peninsula, Mount



SOUTH AUSTRALIA AND NORTHERN TERRITORY

Inset A: Port Augusta to Encounter Bay. Inset B: Adelaide and Environs.

Lofty, and Cape Jervis. He was accompanied by the botanist Robert Brown (q.v.), who made a valuable examination of the coastal flora. Little was known of the interior, however, until 1829, when Charles Sturt (q.v.) made his way laboriously down the Murray to Lake Alexandrina and thence over the sandhills to Encounter Bay. On his return Sturt urged Governor Darling to put in hand a more thorough examination of the Encounter Bay district, and in 1831 Collett Barker (q.v.), on his way back from King George's Sound, was instructed to undertake it. The publicity given to southern Australia by these events brought it under the notice of Edward Gibbon Wakefield (q.v.) and his associates, who were looking for a site for experiments in scientific colonization. It was at first proposed that a joint stock company (the South Australian Land Company) should be granted a charter to establish a colony in South Australia, but this did not meet with the approval of the colonial office, and the company was dissolved. At the end of 1833 a philanthropic body, the South Australian Association, was organized to promote the formation of a settlement on Wakefield's principles, and a bill drafted by it was introduced into the house of commons and after much modification became law on 15 August 1834. This act empowered the government to form a colony or colonies in the territory lying between the 132nd and 141st degrees of east longitude and between the Southern Ocean and the 26th parallel of south latitude. General authority was vested in officials appointed by the colonial office, but the control of land and the land-fund was given to a board of commissioners (the Colonization Commissioners of South Australia) appointed by the Crown. Public lands might be purchased at a uniform price—not less than 12s. per acre—and the proceeds used by the commissioners to promote the migration of labourers to the colony; married men were to be accompanied by their families, and care was to be taken to send the sexes in equal proportion. No convicts were to be sent. The commissioners were authorized to appoint a resident commissioner to act under their instructions. The expenses of the general administration were to be met by loans raised by the commissioners on the security of the future revenue; the colonial office, to secure itself from being involved in any expense, demanded that the settlement should not be formed until the commissioners had invested £20,000 in government stock and had sold in England £35,000 worth of South Australian lands. When the colony possessed a population of 50,000, it might ask for a constitution; but if after ten years the population was still under 20,000, the crown was empowered to take over the commissioners' authority.

Owing to the confused state of British party politics it was not until 15 May 1835 that the names of the 10 commissioners (including Colonel Torrens and George Fife Angas, q.v.) were gazetted. They fixed the uniform price of land at £1 per acre and issued the necessary regulations, but there was little response; Angas therefore proposed to establish a company to buy up sufficient land to meet the requirements of the act, provided the commissioners reduced the price temporarily to 12s. per acre and made provision for special surveys of 4000-acre blocks. These conditions having been agreed to, the South Australian Company was formed, and Angas resigned from the board of commissioners to become its director. Much of the responsibility for settling migrants in the colony now devolved upon the company. On the advice of the commissioners the colonial office had in 1834 offered the governorship to Colonel Charles Napier, afterwards the conqueror of Sind; but he had his own ideas about colonization, which did not coincide with the company's, and in 1835 John Hindmarsh (q.v.) was appointed. Delays, however, still continued, and Angas, in his impatience to begin operations, sent out three vessels, the *Duke of York, Lady Pelham,* and *John Pirie* (which reached Kangaroo Island on 27 July, 30 July, and 16 August 1836 respectively) in advance of the commissioners' party of surveyors. The surveyors, under William Light (q.v.), arrived by the *Rapid* on 21 August. Light looked round for a suitable situation for the capital (Kangaroo Island being obviously unsuitable), and fixed on the present site of Adelaide on the lower Torrens; it was therefore at Holdfast Bay that the governor and the resident commissioner (J. H. Fisher) landed from H.M.S. *Buffalo* on 28 December, on which day the colony was proclaimed. There was at the time a population of 546. Settlers continued to arrive before the necessary surveys were made, and work piled up in the lands department; the confusion was increased by Hindmarsh's objection to Light's choice of the capital site, but Light was supported by the majority of the residents, and it was with him that the selection finally rested. Steps were next taken to establish a judicial system and to raise revenue by the imposition of duties, including customs duties. The scarcity of fresh-food supplies was met by the enterprise of 'overlanders' from New South Wales, who adventured with their herds through unexplored country. Joseph Hawdon, the leader of the first overlanding party, arrived in Adelaide on 3 April 1838 with cattle and horses. During the same year the arrival of Lutheran exiles from Germany (see KAVEL, AUGUST), who were assisted to the colony by Angas and settled on his lands, provided the colony with thoroughly industrious settlers. It already had a newspaper, *The South Australian Gazette and Colonial Register,* the first number of which appeared in London before the departure of H.M.S. *Buffalo,* and the second number, at Adelaide, on 3 June 1837.

The strained relations between the governor and resident commissioner, due to the division of authority between them, led to the recall of both, and their offices were united in the person of Colonel George Gawler (q.v.), who arrived in October 1838. Almost the entire population, then numbering 3680, were still congregated in the vicinity of Adelaide, and men with capital speculated in town lots instead of opening up the country for settlement. Moreover, the survey staff was still undermanned, and their instruments were few and unserviceable. Gawler tried to hasten the work by appointing Sturt (q.v.) temporarily to the surveyor-general's department, but settlers continued to arrive in large numbers (the population in 1840 was 14,600), and he was obliged to open public relief works, and to organize a police force. In 1839-41 he spent £357,615, though the revenue during the same period was only £75,773. He was therefore obliged to meet expenditure by bills drawn on the commissioners. Meanwhile the commission of ten members appointed in London in 1835 had been replaced in January 1840 by a more competent commission of three, known

as the colonial land and emigration board, and empowered to act as emigration commissioners for all British colonies (see MIGRATION). The new commissioners, called upon to meet an increasing number of Gawler's bills, tried to raise a loan of £120,000, failed, and in September 1840 informed Gawler that they could accept no more bills. The colonial office, which had refused to accept financial responsibility for the colony, was obliged, when it became bankrupt, to lend it £155,000; Gawler was replaced by George Grey (q.v.), who had instructions to cut down expenditure drastically, and a select committee was appointed to enquire into South Australian affairs. The committee recommended that the division of authority between the commissioners and the colonial office should be terminated, and South Australia placed on the same basis as other colonies. An act of 1842 gave effect to these recommendations, converted the loan of £155,000 into a gift, and set up a legislative council in the colony. A waste lands act of the same year fixed the minimum price of Australian land at £1 per acre, the proceeds to be divided into two parts, half to be used as an immigration fund and the other half to meet the cost of surveys, public works, etc.

In May 1841 Grey reached South Australia, and despite strong opposition reduced the staff in public departments, abandoned most of the public works, and cut down government wages, thus forcing labourers to seek work up-country. Financial embarrassments obliged the land-jobbers to give up speculation and take to cultivation, thus employing more labour in agriculture; by the end of 1842 every able-bodied labourer was employed, and the land under cultivation had increased from 2503 acres (in 1840) to 19,641 acres. In 1843 the population numbered 17,366, of whom 6107 were in Adelaide and 11,259 in the country—whereas in 1840 8489 were in Adelaide and only 6121 up-country. But cultivation outpaced population, and scientific farmers turned their attention to labour-saving devices; J. W. Bull (q.v.) invented a machine to take the heads from the standing crop, and J. Ridley (q.v.), improving on Bull's invention, made one that not only stripped the heads but thrashed the grain. This stripper gradually revolutionized agriculture, and in 1845 the area under crop totalled 26,218 acres, of which 18,838 were under wheat. The colony was now able to open up a thriving export trade in foodstuffs with the eastern colonies; its prosperity was increased by the discovery of copper at Kapunda (1842) and Burra Burra (1845), and there was an increasing flow of assisted and unassisted immigration. Meanwhile, to protect both settlers and aborigines from dangerous friction, especially on the overlanding route, a resident magistrate and protector of aborigines was stationed in the Murray district.

During Gawler's governorship Eyre had explored the coast west of Spencer Gulf as far as Streaky Bay, and found it barren and waterless; in 1840 he set out for central Australia, skirted Lake Torrens, and thence, via Fowler's Bay, crossed the wastes to Western Australia. In 1844 Sturt led an expedition north as far as Cooper's Creek. For details of these journeys see EXPLORATION BY LAND.

During the last two years of his administration Grey was assisted by a legislative council of seven nominees, three of them officials, which first met on 10 October 1843. While the colony was still in the grip of the financial crisis, he found himself obliged to meet some of Gawler's debts by bills drawn on the British treasury to the amount of £14,000; the treasury refused to meet them, and directed him to issue local interest-bearing bonds. Apart from this episode he enjoyed the confidence of the colonial office, which in 1845 sent him to establish law and order in New Zealand.

Grey's successor, Colonel Robe (1845-8), was a soldier inexperienced in civil administration, and soon became unpopular. Although one of the basic ideas in founding the colony was that the Church must be in no way connected with the state, Robe in 1846 forced through the council a measure providing for government grants to certain religious bodies. His next proposal was that mineral rights should be reserved to the crown and royalties paid for their use; when this came on for discussion, the unofficial members of the council left the council-chamber in a body and thus deprived the governor of the quorum necessary for the transaction of business. This friction in the governmental machinery did not interfere with the progress of the colony; the population increased from 21,759 in 1845 to 38,666 in 1848, and the ordinary revenue from £32,433 to £82,411.

Robe's successor, Sir Henry Young (1848-55), an experienced civilian, administered the colony during the most memorable years of its history. Soon after his arrival he initiated an active main roads policy, and in 1849 an ordinance was passed empowering him to incorporate municipalities. The powers of the Adelaide corporation, which had been in abeyance for nine years, were revived (see LOCAL GOVERNMENT). An imperial act of 1850 provided for a partly elective legislative council, empowered to draw up a constitution; the new council, which met for the first time in 1851, asserted its independence by abolishing state aid to religion. In 1850 the population numbered 63,700; then the gold-discoveries in the eastern colonies drained South Australia not only of its able-bodied men, but also of its specie; nor could it make use for trade purposes of the gold which soon began to pour into it. Under these circumstances the chamber of commerce—which had been established in 1840, had lapsed, and was revived in 1850—memorialized the governor to set aside the currency laws of the Empire and legalize the assay of gold, thus making stamped bullion legal tender. This was done (see CURRENCY), and trade revived. Young also encouraged Francis and W. R. Randell (q.v.) to develop steam-transport on the Murray, but this did not prove remunerative. During 1853 successful diggers gradually made their way back, eager to invest their capital in the pastoral and agricultural industries; land for agricultural purposes was still obtainable in the colony at reasonable prices, and incomers from the east, where much of the land was tied up in pastoral leases, joined in the demand for South Australian farms. As a result agriculture prospered exceedingly, the land revenue increased from £32,935 (1848) to £383,470 (1854), the general revenue from £82,911 to £595,356, and the population increased from 63,700 (1850) to 92,545 (1854).

Young's successor, Sir Richard Graves MacDonnell, arrived in June 1855 to find public attention concentrated on the draft constitution. The wishes of the colonists, ascertained at an election in that year, favoured a democratic constitution, including the principle of manhood suffrage and vote by ballot. [It may be noted,

too, that South Australia was the first colony to adopt the principle of payment of members (1887) and the removal of legal disabilities against women (1895).] The constitution was proclaimed in 1856, and on 24 October Boyle Finniss formed the first ministry; it met parliament in April 1857, but resigned in the following August. The most important measure before this parliament was Torrens's real property act (see TORRENS SYSTEM), which substituted registration of transactions in land for the cumbrous methods previously in force. The colony's immigration policy was vacillating, largely because of the opposition of labour interests. In 1855 the flow of assisted migrants was larger than the industries could absorb, and Governor MacDonnell was obliged to open relief works; assisted immigration was suspended, revived in 1858, and suspended again in 1860-1. In 1863 Sutherland's act reserved one-third of the annual land-fund for assisting migration, but the money thus made available was never much utilized, though for a time there was a considerable demand for miners owing to the opening up of the Wallaroo and Moonta copper-mines.

Meanwhile the country was being opened up, and explorers pushed out beyond the colony's boundaries. In 1858-9 J. McDouall Stuart made his way north of Tennant's Creek; in 1861 he went 100 miles farther north and in 1862 crossed the continent. In 1863, in consequence of these explorations, the Northern Territory (q.v.) was by letters patent brought under the jurisdiction of South Australia, which had already in 1861 extended its western boundary to the 129th meridian. In 1870 the construction of the overland telegraph-line (q.v.) to Darwin was begun, and completed on 22 August 1872. The discovery of the Broken Hill silver-fields during the eighties was of great importance to South Australia; a railway was constructed to connect Broken Hill with Port Pirie, where arrangements were made to treat part of the ore and ship the rest. In 1887 irrigation experiments on the Murray were begun at Renmark by the Chaffey brothers under agreement with the South Australian government. During this prosperity higher education was not neglected. An act of 1874 established a university, and in the following year education was made compulsory and secular, and a council of education was established. In 1884 the South Australian Institute, formed in 1855-6 by the amalgamation of a mechanics' institute and a subscription library (see LIBRARIES), was merged in a public library, museum, and art gallery. South Australia suffered with the other colonies during the depression of the nineties, but recovered along with them after federation. In January 1911 the Northern Territory, which had for long been a white elephant, was taken over by the Commonwealth.

Apart from its connection with the Broken Hill mines, South Australia is chiefly an agricultural and pastoral State. Farming and viticulture (q.v.) are still largely confined to the southern settled districts as the remaining area is handicapped by low rainfall; the dry-farming system (see WHEAT) is being encouraged, however, and a vigorous policy of closer settlement by drainage and irrigation on the Murray pursued by the irrigation and reclamation works department established in 1910. The inland plains are, generally speaking, given over to squatters.

The mineral yield of South Australia itself is small. In 1924 copper to the value of £26,046 and iron ore and ironstone to the value of £667,354 were produced. In 1924-5 3,557,405 acres were under crop, 2,499,852 acres being sown with wheat. The production of wool totalled 58,197,123 lb. The length of railway mileage was 2452 miles; imports totalled £13,970,327 and exports £19,225,027; the revenue was £9,733,038, representing £18 1s. 6d. per head of population. The estimated population on 31 December 1925 was 551,633, of whom 282,790 were males and 268,843 females. Of this total, about 60 per cent were in urban areas. In 1924-5 shipping totalling 4,573,822 tons entered Port Adelaide, the principal port of the State.

See J. W. Bull's *Early Experiences in South Australia* (Adelaide, 1878); E. Hodder's *History of South Australia* (London, 1893), and *Founding of South Australia, as recorded in the journal of Mr. Robert Gouger, first colonial secretary* (London, 1898); G. W. Rusden's *History of Australia* (London, 1897); J. E. Heeres's *The Part Borne by the Dutch in the Discovery of Australia* (London, 1899); J. Blacket's *History of South Australia* (Adelaide, 1911); and A. G. Price's *Foundation and Settlement of South Australia* (Adelaide, 1924).

A.D.A.

Southerly Buster. See METEOROLOGY AND CLIMATE.

Southern Cross, THE, a constellation in the southern heavens first officially segregated and named *Crux* by the astronomer Royer in 1679. It was, however, well known as a star-group many centuries earlier. Though now visible in the northern hemisphere only during April and May at places south of 30° N. lat. (e.g. southern Tripoli, Egypt, Arabia, the East Indies, southern China, the Malay Archipelago, and Mexico), 3000 years ago it could be seen by Chaldean astronomers, and about 70 A.D. was still visible at Alexandria. Ptolemy (140 A.D.) included its stars in the constellation *Centaurus*. The first reference to it in modern literature occurs in Dante's *Purgatorio* (i., 22-27), where, emerging from the antipodean gate of hell, the poet set his mind on the southern pole,

e vidi quattro stelle
non viste mai fuor che alla prima gente.
Goder pareva il ciel di lor fiammelle.
O settentrional vedovo sito,
poichè privato sei di mirar quelle!

I saw four stars that never
Were seen excepting by the folk primeval.
The heavens seemed in their flamelets to be joying.
O desolate indeed, thou northern region,
Since upon these thou art bereft of gazing!

(*Sir S. W. Griffith's translation.*)

These four stars Dante used to symbolize the four moral virtues (Justice, Prudence, Temperance, and Fortitude). His mention of them has never been satisfactorily explained, but it is believed that he saw the group mapped on a celestial globe of Arabian origin. His ascription to them of great brightness, which has misled poets and other writers ever since, is merely part of the symbolism; it was the virtues, not the four actual stars, whose radiance he celebrated.

In February 1502 Amerigo Vespucci, voyaging in the South Atlantic, noted a group of stars near the southern celestial pole 'much larger and more brilliant than those of our pole;' elsewhere he says that the southern pole has no Great or Little Bear, but 'the stars which surround it are four, in the form of a

quadrangle.' And in 1505 Ludovico Barthema (or Varthema), travelling from Borneo to Java in an Arab or Malay vessel, learnt from its master that he navigated by 'four or five stars, below which there was one other, lying directly opposite our North Star.' It may be noted that this quotation comes from Barthema's own book of 1517; a recension of it published in 1613 says 'four or five very beautiful stars.' The first writer to recognize the 'cross' shape was Andrea Corsali, who in 1517 both described and figured the group as a cross; after this time the name 'Cross' or 'Crosiers' recurs frequently, and the constellation appears as such on Molineux's globe of 1592. A reference to it in Camoens's *Lusiad* (1572), however, is vague:—

> Now we discovered shining straight before us
> In the new hemisphere a star as new,
> Unseen by other people.
> (*Sir T. L. Mitchell's translation.*)

Popular recognition of the group, therefore, much antedated Royer's scientific acknowledgment of its existence.

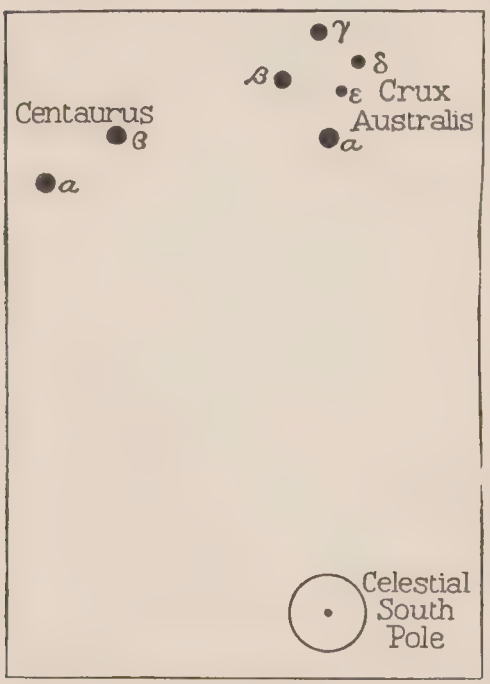
Since the 17th century the Southern Cross has been a favourite theme of travellers and poets —especially of those who have never seen it, and take it on trust from Dante. Thus Swinburne celebrates it as a 'fourfold morning of starshine'

> Whose grace and ghostly glory
> Poured heaven on purgatory,
> Seeing with their flamelets risen all heaven grow glad.

Brunton Stephens, on the other hand, who had seen it, calls it 'the gem-pointed Cross,' but in a calmer moment admits that it is

> Not quite what the shape of a cross is,
> A little lop-sided, I own.

It owes its reputation, indeed, not so much to its brilliancy as to its position—on the edge



The Southern Cross.

of a gap in the Milky Way known as the 'Coalhole,' whose black void sets off the comparative brightness of three of the *Crux* stars—and to the fact that its longer axis points directly south, thus making it a useful guide to early mariners in southern seas.

Crux lies in the heavens about one-third of the way between the southern celestial pole and the equator, its declination being about 60° S. One of its stars, a double one, is barely of the first magnitude, two barely of the second, one is a third-magnitude star, and one that lies near the crossing of the arms is fainter still. Two much more conspicuous neighbouring stars —Alpha and Beta *Centauri*—are known as 'the pointers' because a line drawn through them passes through the northern limb of the Cross, and so makes it easily found. The constellation is at its highest in the heavens in April and May, when alone it can be seen in the northern hemisphere. At Canberra between 8 p.m. and 11 p.m. in those months the pointers are almost overhead. About the same time in the evenings of October and November the Cross lies low on the horizon at its farthest south; it is then invisible from any part of Australia north of lat. 28° S.—i.e. from Queensland, the Northern Territory, South Australia north of Lake Eyre, and Western Australia north of Geraldton.

Its reputation as a notable feature of the southern night-skies has brought about its use as a distinctive badge in several countries of the southern hemisphere. Brazil placed it on her postage-stamps in 1889-91. New Zealand uses four of its stars on her blue ensign, and the Commonwealth five on hers. The five recur in the arms of the State of Victoria (see SEALS AND ARMORIAL BEARINGS); the four stars (technically mullets) on the silver cross of the New South Wales arms have probably the same origin.

Spangled Grunter, a small freshwater fish (*Therapon unicolor*) widely distributed in streams of tropical and subtropical Australia. It apparently aestivates in dried mud during periods of drought, becoming active again when liberated by rain. Its appearance in artesian water-channels soon after the first flow of water has led to the belief that it came out of the bore; and the fact that its eyes sometimes protrude and drop out—as a result of a disease caused by excess of gas in the water—has been incorrectly attributed to a reduction of pressure upon its liberation from subterranean streams. This is discussed by C. Coleridge Farr in the *Report* of the Australasian Association for the Advancement of Science, 1911 (p. 354).

A.R.McC.

Spartothamnus, a genus of the family Verbenaceae, with one species endemic in Australia. The calyx is very open, 5-lobed; corolla-tube short and broad; stamens 4, protruding, the anther-cells with minute tips at the lower end; fruit a small, globular, succulent drupe. *S. junceus* is an undershrub with acutely 4-angled divaricate branches, broom-like in habit and almost leafless; the flowers are small, with a ring of short hair inside, near the top of the corolla.

Spear-fish. See SWORD-FISHES.

Spearmint. See MENTHA.

Spence, CATHERINE HELEN (1825-1910), born at Melrose in Scotland on 31 October 1825, migrated to South Australia in 1839; her father in 1840 became the first town-clerk of Adelaide, and died in 1846. Catherine in 1843 became a governess, and in 1846 opened a school, but

at the age of 25 gave up teaching for journalism. In 1859 she became interested in proportional representation as propounded by Thomas Hare in 1857. Two years later she contributed to the *Register* a series of articles, most of which were embodied in *A Plea for Pure Democracy* (1861). This pamphlet was welcomed by Hare, John Stuart Mill, and other social reformers.

In 1865 she visited England and contributed to the *Cornhill Magazine* and the *Fortnightly Review*. In 1878-93 she was a contributor to the *Register*, her best work appearing over the signature 'A Colonist of 1839.' She associated herself with Caroline E. Clark in her efforts to have the boarding-out of state wards substituted for institutional care, and from 1872 was a member of the boarding-out committee. She was also a member of the board of advice under the department of education, and in 1880 wrote an elementary handbook of civics, *The Laws We Live Under*. Meanwhile she publicly advocated a system of 'effective voting' which she called the 'Hare-Spence' system. Her modification, however, did not affect any of Hare's essential principles.

In 1893 she was a delegate to the international charity conference in connection with the World's Fair at Chicago, and subsequently visited Europe. In 1896 she was made a member of a commission appointed to enquire into Adelaide hospital. Her chief interest, however, was 'effective voting,' and a league was organized under her presidency to further it. Although she took no very active part in the women's suffrage movement, she stood, unsuccessfully, for the federal convention in 1897. In 1907 she wrote *State Children in Australia*, and was engaged on her autobiography when she died at Norwood in South Australia on 3 April 1910. This, completed by Jeanne F. Young, appeared serially in the *Register* in the same year. In 1912 her portrait in oils was purchased by public subscription for the Adelaide art gallery, and a university travelling scholarship for women was established in her honour.

A.D.A.

Spencer, Sir Walter Baldwin, born at Stretford in Lancashire in 1860 and educated at Owens College, Manchester, and Exeter College, Oxford (B.A., 1884; M.A., Melb., 1888; D.Sc. and Litt. D., Melb.), was in 1885 made assistant-professor of human and comparative anatomy at Oxford, and in February 1887 appointed to the chair of biology in the university of Melbourne. In 1894 he accompanied the Horn expedition (see Horn, W. A.) to Central Australia, and afterwards edited its reports; in 1899 he collaborated with F. J. Gillen, a postal official stationed in central Australia and a sound ethnologist, in publishing *The Native Tribes of Central Australia*. In 1902 he and Gillen crossed Australia from south to north to study the still uncontaminated tribes of the Northern Territory, and published their conclusions in *The Northern Tribes of Central Australia* (1904) and *Across Australia* (1912), volumes which brought Spencer into prominence as an ethnologist. Settling down again to work at the university, he was in 1904-11 president of the professorial board and member of the university council. In 1912 he acted as special commissioner and chief protector of aborigines for the Commonwealth government; his report, *The Native Tribes of the Northern Territory*, made valuable suggestions with regard to the future treatment of the aborigines. In 1914 he was honorary secretary for the Melbourne meeting of the British Association for the Advancement of Science. In 1919 he resigned his chair at the university and was made emeritus professor. He is a trustee of the Melbourne public library, national gallery, and museums, and honorary director of the national museum. In 1900 he was elected a fellow of the Royal Society; he is also a corresponding member of the Zoological Society of London, and honorary fellow of the anthropological institutes of Great Britain, Italy, and Washington. Besides the anthropological treatises mentioned above he has published *The Presence and Structure of the Pineal Eye in Lacertilia*. (C.M.G., 1904; K.C.M.G., 1916.)

J.V.C.-B.

Spiders, vernacular name of an order (Araneida) of the class Arachnida (q.v.) easily distinguished from other arachnids by the constriction of their bodies and by their possession of external spinning-organs.

Of very variable form, they are classified according to the number and disposition of their eyes (eight or six in number), the structure of the epigynum—a variable organ connected with the oviduct in the female—the spinnerets, the chelicerae or falces, and other organs. The Cribellatae, for example, have besides the spinnerets a supplementary spinning-organ (cribellum), which enables them to produce exceedingly fine silk, and in correlation with it a comb of stiff bristles (calamistrum) on the metatarsi of the fourth pair of legs.

Australia abounds in indigenous spiders; more than 2000 species have been described, and many more await determination. Out of the 41 families into which Simon divides this great order, 25 are represented in Australia. One of the most interesting to the layman is the Aviculariidae (trap-door spiders), of which 146 Australian species have been described. Many trap-door spiders are provided with a digging apparatus (rastellum), which consists of a series of teeth at the extremities of the falces. The trap-doors are of two types, the thick or cork-lidded, and the thin or wafer-lidded. The former usually occur on banks or gently sloping hills, and the latter in level areas. Probably the commonest trap-door spider in a given locality is *Blakistonia aurea*; in parks and gardens and along highways near Adelaide the nests of this species occur in great numbers, sometimes several to the square yard; it is also found throughout South Australia, and as far east as Broken Hill in New South Wales. The lid is of the cork type, thick and heavy, nearly round, and fitting tightly when closed. As usual with trap-door spiders, the inhabitants of the burrows are always females; the males are found, especially in cold weather, hidden under stones. The young, after leaving the pillow-shaped egg-sac which is suspended half-way down the tube, seem to stay with the mother for a considerable time. After extrusion from the egg-sac they remain domiciled within the tube until spring, when they colonize near the burrow. The first infantile burrows are not provided with lids; but after about the third month a lid is constructed and placed in position, and thenceforth the spider increases the size of its burrow as it grows, and adds to the lid until the maximum is reached. In wet weather burrows may be half-full of water, but this does not seem to incommode the residents. The presence of enemies, especially of the larger predatory wasps, makes it necessary for the spider to seal its burrow

by spinning silk round the edge of the lid on the inside surface.

Many species of Avicularidae construct no lid to their tunnels. Among these is *Selenocosmia crassipes* (Barking Spider), a large and widely distributed species found in the hottest parts of Australia, and remarkable for its stridulating power. Sir Baldwin Spencer, who found numerous specimens at Charlotte Waters and Alice Springs in central Australia, says:—

> It lives in burrows in hard ground; on the surface is a hole perhaps an inch in diameter leading into the burrow, which goes down in a slightly slanting direction to the depth of a foot and a half or even more, where it ends in a more or less spherical space about two inches in diameter, in which, during the daytime, the spider lies. In this chamber were remains of beetles and small portions of web. All the specimens secured ... were females. ... One day, whilst teasing a large female...with a piece of straw, it raised its body, and, rubbing its palps against the mandibles, it made a distinctly audible whistling noise.

The stridulating-organ consists of modified surfaces on the inner face of the first joint of the palp and the outer face of the mandible, which are fully described and figured in the *Report on the Work of the Horn Scientific Expedition.*

The larger trap-door spiders should not be handled carelessly, as they are armed with long and more or less venomous fangs, capable of inflicting painful—but not, so far as is known, fatal—wounds. The wounded part should be sucked, and afterwards rubbed with hartshorn.

The largest Australian kind is *Selenotypus plumipes* from northern Queensland. Its length,

Selenotypus plumipes.

including the falces, is about 2¼ inches, and its breadth at the widest point ¾-inch. Its legs are powerful; the fourth (the longest) pair measures 2¾ inches. It is of a chocolate-brown colour, and when irritated or attacked will fight fiercely.

Of the Cribellatae six families occur in Australia. An interesting one is the Hypochilidae, with only two known species, one found in China, and the other (*Ectatostica troglodytes*) in Tasmania; these two species have four lung-books, whereas all other spiders except the Theraphosidae have two only. *E. troglodytes* may be found in the Mole Creek caves and in the limestone caves of the Pieman River.

The two most important families of this section are the Uloboridae and the Dictynidae. In both we find species living in communities —an unusual occurrence. Near Sydney is found *Uloborus congregabilis*, a small spider with a hunched abdomen, which makes a beautiful small orbicular web, with a hackled ribbon of white silk (stabilimentum) running across the middle.

Uloborus congregabilis.

Sometimes dozens of these orb-webs may be observed on a bush, all linked together, almost covering it. Individuals of this species occasionally invade buildings; these are usually lighter in colour than those living in the open air. *Amaurobius socialis*, a dictynid, also lives in large communities, which construct in common enormous webs like shawls; they may be seen in the Grand Arch at the Jenolan caves. The genus *Amaurobius* is of world-wide distribution. Its representatives frequently construct untidy-looking webs in the angles of walls or window-frames in outhouses; in them is a tubular retreat wherein the animal rests and whence it rushes out when the vibration of its snare announces the entanglement of some hapless insect.

The Ecribellatae include no less than 30 families, of which 17 occur in Australia. Prominent among these is the Theridiidae, a family with a world-wide distribution, none of whose species are large, and many are exceedingly small. Some are prettily marked, and a few glitter like silver. This family includes the dreaded satiny-black spider with the red stripe, *Latrodectus hasselti*. Stories as to the potency of its venom are often exaggerated; the bite is painful, but there are no instances, in official records, of death supervening. At the request of the writer of this article, Frank Tidswell made a number of experiments on small animals (such as rabbits, guinea-pigs, and white mice); and, though all were affected more or less after being bitten, all recovered without treatment, the result of the bite in each case being local. With the human subject, fear often aggravates the effect. In New Zealand *L. hasselti* is known as the 'katipo.' As to the effects of its bite, according to Castellani and Chalmers, the symptoms begin in about 30 minutes with the formation of a white vesicle surrounded by a red halo, and severe pain at the site of the bite. The general symptoms include, first, stiffness of the muscles about the mouth and jaw, so that it is difficult to open the mouth or to speak, and impossible to swallow. Treatment: prevent absorption by the proximal ligature, open the wound by an incision, and apply alkaline solutions—e.g. weak solutions of ammonia or carbonate of potash.

The family Argiopidae includes some of the most familiar spiders; about 300 species, distributed over many genera, are known in Australia. The largest constitute the tropical genus *Nephila*, of which, however, representatives occur both in New South Wales and in Victoria. *Nephila* females are often very large and obese, but the

males are veritable pygmies. Their webs are huge, orbicular, bright yellow, remarkably viscid, and strong enough to capture small birds; the commonest species is *N. maculata* and its varieties, widely distributed not only in Australia but also in Indo-Malaysia, whence it has probably spread. The common orb-weaver of suburban gardens is *Araneus productus*; its web is not so large and sticky as the *Nephila* snare,

Araneus productus.

nor is it yellow. Another species familiar in scrub-lands and gardens is *Singotype wagneri*, the abdomen of which is mottled with yellow, green, and brown. The web is of the composite type, adding to the orb a large number of irregular and apparently random lines like the characteristic snares of Theridiidae. Incorporated amongst these irregular lines, and furnished with communicating 'wires,' is a rolled-leaf nest, within which the sexes dwell. Eucalyptus leaves are most frequently used, but nests made of scraps of paper are not uncommon. Another species, *S. sylvicola*, has the same weaving and nesting habits; but the species is more soberly coloured, the abdomen having in front a large, very dark brown, transverse patch, strongly cleft at the centre; thence it is light gray towards the middle, where it becomes suddenly dark gray. A web that attracts popular attention is that of the beautiful St. Andrew cross spider, found in many parts of Australia, Papua, and Malaysia, whose orbicular snare has at the centre a prominent stabilimentum of white hackled silk in the form of a St. Andrew's cross. This spider has its cephalothorax densely clothed with white silky pile, and the abdomen ornamented with transverse bars of yellow and silky-white. A few Australian species of the genus *Gasteracantha* have a hard chitinous abdomen armed with long sharp spines. *G. minax* is small, black-and-white with yellow spots. The web is orbicular.

Although the orb-weaving habit may be considered characteristic of the Argiopidae, it is by no means universal with the family—thus *Celaenia excavata* is remarkable for simulating the faeces of a bird. This rather common spider selects a leaf of a tree, spins a little silk over the surface (in order to enable it by the aid of its tarsal claws to maintain its position), and bunches up its legs close to the body. This is dark-brown and dirty chalk-white in colour, rough and irregular in shape, and looks so like the dropping of a bird that natural enemies, as well as prey, are deceived thereby. No web is fabricated as a snare, though a little is spun by the female for the purpose of suspending its egg-sacs. The Magnificent Spider (*Dicrostichus magnificus*) does not construct an orb web; according to Heber Longman it fishes for its prey. It spins a fine line of silk 1½ inches long, and to the end attaches a globule of viscid matter; the line is held out by one of the fore-legs. On the approach of a desired insect, the spider whirls the thread, and the globule adheres to the victim, which the spider then draws up and kills. The usual prey is a common species of noctuid moth, *Remigra frugalis*. The spider lurks during the day in a silken retreat, usually close to its egg-bags, which are sometimes six in number, each about four inches long and an inch in diameter.

In the Thomisidae (flower spiders) the legs are laterigrade; hence they can move forwards, backwards, and sideways with celerity. The first two pairs of legs are always the longest. Arboreal in habit, they do not construct webs, but capture prey either by hunting or lying in wait. Many species hide in flowers, and these are often brightly coloured. Others are gray or brown, in conformity with the bark upon which they are frequently found; many have rough and uneven bodies, thus adding to their power of concealment. With few exceptions, the body is short and broad. About 130 species, representing 23 genera, have been recorded from Australia.

The family Clubionidae is well represented, 177 species having been so far recorded. Its most important sub-family is the Sparassinae, species of which are abundant in all tropical and subtropical countries. They are large, hairy, and flat, and are (under the misnomer 'tarantula'—the true tarantula is a native of Europe, and a member of the Lycosidae) generally regarded with a fear out of all proportion to their timid nature and defenceless character. Naturally arboreal, they are generally found under the loose bark of trees, though individuals sometimes invade buildings—where, no doubt, their presence is of advantage, since they prey largely upon flies. Owing to their habitat, their legs have become laterigrade, like those of the Thomisidae. Hogg, in a fine study of this sub-family, says:—

> In Australia the indigenous species have developed a distinctly characteristic type of genital organ. In by far the larger number, the stylus in the male palp is produced into a flagellum of remarkable length, sometimes more than twice the length of the cephalothorax; this, for its protection, is curled spirally round a specially grooved drum, and this again has been formed by the rolling up of a riband-like elongation of a projection which has had its use as a feeler. The two parts are quite separate and detachable, and can be unrolled. This particular development is unique and, so far as I am aware, entirely confined to the Australian region.

Ova-sacs of the Sparassinae are white, of close texture, strong, round, and cushion-shaped, and suspended by strands of silk. The two largest genera are *Isopeda* and *Olios*. The genus *Heteropoda* also contains a number of large spiders, one of which, *H. venatoria*, must have practically circumaviated the world, owing to its habit of 'ballooning.' It is supposed to have originated in the Indo-Malaysian area, the young being carried east by the NE. and SE. trade-winds, until ultimately they linked up again with the point of starting. It is found only in areas affected by these winds, and so does not occur in Tasmania or New Zealand.

The Clubionidae are mostly small or medium-sized, neither flat nor laterigrade and generally pale-coloured and devoid of markings; they live in silken tubes on leaves, or under bark or stones. Their tarsi are furnished with conspicuous pads of terminal hairs of complicated structure.

The family Agelenidae is remarkable for its marine spiders, three species of which (of the genus *Desis*) are found in Australia; the most familiar is *D. marina*, which occurs in northern and eastern Australia, Papua, New Zealand, and New Caledonia, living on the sea-coast between tide-marks. In tropical regions discarded *Lithodomus* holes are selected for their retreats, but in more temperate regions, where this boring mollusc does not occur, fissures in rocks are utilized. As the tide rises, the water is kept from invading the interior of these recesses by a curtain of silk. When the tide is out *Desis* breaks down the curtain, and sallies forth in quest of prey.

The Lycosidae (wolf spiders) are terrestrial, and make fairly deep burrows in the soil, lining them with silk in much the same manner as trap-door spiders. Generally speaking, they do not construct trap-doors, but R. H. Pulleine has discovered desert forms that do. These build a firm collar to hold the lid, the latter having a primitive hinge. But for these lids the burrows would be in constant danger of being filled with drift from sand-storms, as their mouth is usually flush with the surface. Some species, however, build a turret to protect the entrance. They are more or less nocturnal. Female lycosids carry their egg-sac attached to the spinnerets. After hatching, the young climb upon the body of the mother, and are carried about by her for a considerable time. When old enough to forage for themselves, the spiderlings are distributed by the process of 'ballooning.' Nine genera, 84 species, and a few varieties have been so far recorded from Australia. The world-wide genus *Lycosa* is most numerously represented in our fauna, and the commonest species is *L. godeffroyi*.

Finally come the widely distributed Salticidae (jumpers), of which the greater majority are minute. They are common on plants, walls of buildings, and fences, and often closely harmonize in colour with their surroundings. Their bodies are frequently clothed with scale-like hairs, which may be brilliant or iridescent. The legs are short and stout, the movements are rapid either forwards or sideways; the front eyes are the largest, and often brilliantly scintillating. Some species are ant-like in form, and usually found in company with ants, running among them in the ant's seemingly objectless manner and—to add further to the deception—carrying the two front legs extended to simulate antennae. Two of the most interesting forms known to naturalists are *Saitis volans* and *S. splendens*; the male of each, besides being brilliantly coloured, has a laterally flattened extension of the abdomen, which, when at rest, is folded round like a blanket, but when the animal springs is thrown out and acts to a certain extent like wings. The species are so small that they do not attract attention. The first specimen of *S. volans* taken by the writer was in the botanic gardens in Sydney; the late George Masters collected one near Brisbane. The sexes differ little in size, but considerably in other respects. Dr. and Mrs. Peckham observed the males of some species dancing and performing curious antics in front of the females—such as holding their front-legs outwards or above their heads, so as to display their colours and attract attention. The Salticidae are hunters. Sixty-four genera and about 220 species have been recorded from Australia.

See Rainbow's 'A Census of Australian Araneidae,' in the *Records of the Australian Museum* (1911), Koch's *Die Arachniden Australiens* (1885), Simon's *Histoire Naturelle des Araignées* (1892) and *Die Fauna Südwest-Australiens* (vols. i and ii, 1907-9), Thorell's *Studi Ragni Mal. e Papuani* (1881), and the *Cambridge Natural History* (1909). W.J.R.

Spinebill. See HONEY-EATERS.

Spinifex, a name popularly applied to two widely different groups of grasses because of their thorny nature. As a generic name it belongs to several species of salt-loving grass, the best-known of which is *S. hirsutus* (Hairy Spinifex, Spiny Rolling Grass); this has a wide range along the coasts of India, China, Australasia, and the Pacific islands, and is an excellent sand-binder. Its seed-heads, to quote von Mueller, 'becoming detached at maturity, are carried by the wind along the sands, propelled by their elastic spines and dropping their seeds as they roll. . . . The heads are so buoyant as to float lightly on the water, and, while their uppermost spiny rays act as sails, they are carried across narrow inlets to continue the process.' *S. paradoxus* occurs in the interior of Australia in the most barren of situations.

The more widely known spinifex, which covers the interior plains for hundreds of miles, is *Triodia irritans*, known also as Porcupine Grass, and is well described in Carnegie's *Spinifex and Sand*:—'Spinifex grows in round, isolated hummocks, one to three feet high; these hummocks are a dense mass of needle-like prickles, and from them grow tall blades of very coarse grass to a height of sometimes six feet . . . camels and horses suffer rather severely sometimes, the constant pricking causing sores on their legs . . . There are few uses for this horrible plant; for example, it forms a shelter and its roots make food for the kangaroo- or spinifex-rat; from its spikes the natives make a very serviceable gum, it burns freely, serves in a measure to bind the sand. . . . In northern Australia spinifex is in seed for three weeks, and when in this state forms most excellent food for horses, and fattens almost as quickly as oats; for the rest of the year it is useless.' E.B.

Spofforth, FREDERICK ROBERT (1855-1926), born at Balmain, a suburb of Sydney, on 9 September 1855, is considered by many authorities including notable Englishmen, the greatest bowler cricket has known. In the international sense he made his name with the Australian eleven of 1878 (see CRICKET), his bowling proving so deadly and sensational that he was nick-named 'The Demon' and immortalized in *Punch* with other members of that surprising team. Six feet three inches in height, straight as a sapling, and active as a kangaroo, he had a beautiful run and perfect delivery of the ball. He bowled very fast, yet could alter the pace without altering his delivery; his break-back on English wickets was astonishing, and he could also bowl a 'wind-jamming yorker.' His power of detecting a batsman's weakness was remarkable. He was a New South Wales cricketer from 1874 to 1885, but later played for Victoria. Spofforth was a member of the 1878, 1880, 1882, 1884, and 1886 Australian teams, and in the eleven-a-side matches on these tours secured 662 wickets at an average cost of a trifle over 12 runs per wicket. In the 1880 tour in eleven-a-side matches he took 46 wickets at an average of 8.28, and in all matches 391 wickets at 5.63. In 1892 he settled in England, and for some years played for Derbyshire with great success. Since then he has twice visited Australia and on his latest trip, in 1925, saw Australia defeat

England in the tests. Spofforth ranks as one of the greatest figures in the history of the game. His most notable feats were achieved on English wickets, where he startled all England in 1878 by his terrific bowling against the M.C.C. at Lord's when what was practically an All England eleven was beaten in the one day. For New South Wales against Victoria he secured 49 wickets at an average cost of 21.28 runs, and for Victoria against New South Wales 26 at 14.8. In test matches against England his record is 94 wickets at 18.41 runs apiece. Spofforth is the only bowler who has ever taken 14 wickets in a test match. He died in London on 4 June 1926.

J.C.D.

Sponges, a name originally applied to a few highly organized and untypical genera of the large group Porifera (an isolated and comparatively simple section of the Metazoa), but now for scientific purposes co-extensive with the whole group. The species are almost exclusively marine, and occur in all seas from the equator to the poles and at all depths from the shore-line to the deepest abysses. Most are plant-like in appearance and grow by budding, the individuals forming a continuous colony and frequently merging into one another until individuality seems altogether lost; to increase the plant-like appearance there are often roots, but these serve solely to anchor the colony, and convey no nourishment to it. Reproduction takes place through fertilized eggs, which produce a free-swimming larva; this sooner or later affixes itself to a rock or other base and begins to bud. Sponges may be roughly classified according to their skeletal character into (*a*) slime sponges, which have no skeleton at all, (*b*) keratose or horny sponges, whose skeletal network is composed of fibres of spongin—a horny material with a chemical composition very like that of silk, (*c*) all other sponges, which have a skeleton of siliceous or calcareous spicules. Of these the second group alone corresponds to the popular idea of a sponge, and includes the species of commercial value which have now to be considered.

There are three main types of commercial sponge—the Turkey or Syrian silk, the Horse (sheepswool, velvet, honeycomb), and the Zimocca or hardhead. The Turkey Sponge (*Euspongia officinalis*) is a product of the Mediterranean alone; the Zimocca (*E. Zimocca*) is a Mediterranean sponge, but closely resembles the hardhead or yellow sponge of the Florida and Bahama fisheries; the Horse Sponge (*Hippospongia equina*) is the Mediterranean analogue of several North American *Hippospongia* species. All these varieties can be matched by Australian species. *H. equina* has been found on the coast of every Australian State except Victoria, and specimens from Barranjuey in New South Wales possess all the qualities of the best Mediterranean products. *E. Zimocca* has been found at Lilli Pilli, near Sydney. *E. officinalis* is represented by several varieties, of which *dura*—a velvety, but tough and incompressible sponge—is the commonest, and *lamella* (Elephant Ear)—at present only known from Torres Straits—is most valuable commercially. In addition there is a *Euspongia* (*E. illawarrae*) believed to be endemic in Australia, which equals and often surpasses the best European sponges, being soft, tough, highly elastic, durable, and almost free from intrusive matter. An expedition to the Barrier Reef, sent out in 1918 to ascertain the possibilities of establishing a sponge industry in Australia, discovered sponges in commercial quantities on both inner and outer reefs, the latter being of finer quality. But the growth is patchy, and the reefs for the most part unnamed and uncharted, so that there are considerable difficulties in the way of organizing a regular fishery; at the same time bêche-de-mer fishers have for years past carried on a desultory trade in sponges with the chemists of northern Queensland ports.

Sponges are procured by diving, machine-diving, 'hooking,' and dredging. Of these methods 'hooking' (which involves the manipulation of 3-tined hooks on very long poles from dinghies) can only be done under favourable weather conditions, and would be impossible on the reef during the greater part of the year. Machine-diving has been responsible for much loss of life, and for general ill-health among the sponge-gatherers, which ameliorative legislation has failed to prevent. Dredges can be employed only on smooth bottoms, and collect much that is unmarketable. Straightforward diving—the method which has been employed since the earliest times—seems therefore the only safe and profitable way of sponge-getting.

The United States fisheries bureau has for some years carried on experiments in establishing artificial sponge-fields, and in the Mediterranean sponges have been artificially planted and left to grow. So far, however, all such attempts have been failures financially, though it is probable that this method of sponge-culture will be established in the near future.

With sponges of no commercial value the waters surrounding Australia are well supplied, Port Jackson being especially rich in them. Species of *Sycon* (a sponge with a calcareous skeleton) resemble elegant vases, except one (*S. gelatinosum*) which has branches. *Ianthella flabelliformis* is black and fan-shaped. Siliceous sponges are represented mainly by members of the family Chalininae, especially the irregularly fan-shaped *Chalina finitima,* and by *Clathria* species of the family Ectyoninae. Of horny sponges (apart from the commercial varieties) the most conspicuous is *Dactylochalina reticulata,* a light-coloured sponge with long cylindrical branches that may run to two feet in length. Species of *Thorecta,* with shapes ranging from fan to cup, are also common.

See Hallmann's report on sponges in the *Zoological Results of the F.I.S. 'Endeavour,'* 1912; Lendenfeld's *Descriptive Catalogue of Sponges in the Australian Museum* (1888); Whitelegge's account of sponges trawled by H.M.C.S. *Thetis* in *Memoir IV* of the Australian Museum (1906-7), and his report on sponges in the *Records of the Australian Museum* (1901); and many articles in the *Proceedings* of the Linnean Society of New South Wales, 1914-19.

M.E.

Spoonbills. See IBISES, SPOONBILLS, AND STORKS.

Spoon Lily. See CUNJEVOI.

Sprat. Under this name several small herrings are commonly recognized, one of which (*Clupea bassensis*) is very close to the English sprat. It is occasionally very plentiful on the Tasmanian coast, and on one occasion vast quantities—estimated at several hundred tons in weight—were driven ashore in a shallow bay. The Sandy Sprat (*Hyperlophus vittatus*) frequents sandy localities along the coast of New South Wales, but, though it occurs in large numbers, is rarely utilized; it is an excellent food-fish, though only about five inches long, and in life almost transparent. With organized

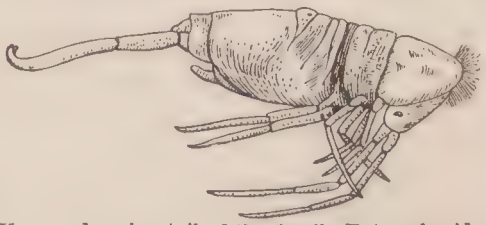
fishing both these species could doubtless be captured and marketed with profit; at the present time, however, little definite information is available concerning their appearance and distribution. The young of the freshwater herring (see HERRINGS) is commonly known as 'sprat.'

A.R.McC.

Sprengelia, a genus of the family Epacridaceae, consisting of small shrubs, usually found in moist situations. The three species are endemic in eastern Australia. The corolla-tube is very short, sometimes separating into almost distinct petals with 5 spreading lobes; anthers connected, often cohering in a ring round the style; fruit a capsule. *S. incarnata* has pinkish flowers of a papery texture. This species and *S. ponceletia* are swamp-dwellers. *S. ponceletioides* is a diffuse wiry shrub, growing on the face of damp rocks in shady gullies, with a limited range on the Blue Mountains of New South Wales.

S. incarnata.

Spring-tails, vernacular name of the order Collembola, small wingless insects with only six abdominal segments; the appendages of the fourth segment are specialized to form a spring, and those of the first segment to form a ventral tube. Spring-tails are widely distributed over the world, and many species are common in Australia, but only five have been described. The order contains two sub-orders. In the sub-order Symphypleona the body is elongated and the abdominal segments are well marked. The two families, Poduridae and Entomobryidae, are both common in Australia. From Tasmania and New Zealand Lubbock has described three species of *Anoura* remarkable for their size, their sluggish habits, and their inability to jump. They measure up to $\frac{2}{3}$ in. long and are broad in proportion, thus being easily the most bulky Collembola known. Borner has recently separated them into three genera, but they appear to be very closely related. Two minute pond-dwelling Poduridae have also been described by Rainbow. A large entomobryid of a purplish colour, common round Sydney in leaf-mould, debris, etc., is figured.



Unnamed spring-tail of the family Entomobryidae (x 13).

In the sub-order Arthropleona the body is globular, and the segmentation of the abdomen obliterated. There is only one family, the Sminthuridae, tiny creatures which possess great leaping powers. They are fairly common in most parts of Australia, but none have so far been described, unless we can include *Arrhopalites davidi,* from Macquarie Island.

See Lubbock in the *Journal* of the Linnean Society (1899); Rainbow in the *Records of the Australian Museum* (vol. vi); and Alexander's paper on 'Aptera of Australia' reprinted in the *Report* of the Australasian Association for the Advancement of Science (1913).

R.J.T.

Squatting. See PASTORAL INDUSTRY.

Squeaker. See MAGPIES.

Squid. See MOLLUSCA.

Squire. See SNAPPER.

Staghorn. See FERNS.

Stanton, GEORGE HENRY (1835-1905), born at Stratford in England on 3 September 1835 and educated at Hertford College, Oxford (B.A., 1888; M.A., 1862; hon. D.D., 1878) was in

1858 ordained deacon (priest, 1859) and appointed curate of Christ Church, Rotherhithe. In 1862 he became curate of All Saints, Maidstone, in 1864 went to St. Saviour's in Fitzroy-square, London, and in 1867 became rector of Holy Trinity, St. Giles-in-the-Fields, where he established a working-men's club and kindred institutions. On 24 June 1878 he was consecrated bishop of North Queensland in St. Paul's cathedral by the archbishop of Canterbury. His fine missionary work in that immense and scarcely organized diocese brought about his translation in 1891 to Newcastle, where he gained the confidence of the coal-miners by a close study of their working conditions, their social beliefs, and their crude adaptation of Marxian economics. When health failed him, he appointed a coadjutor-bishop, John Francis Stretch, for the active work of the diocese, but retained the management of affairs to the last. He died on 4 December 1905.

Starfish. See ECHINODERMATA.

Starlings, perching birds belonging to the families Sturnidae and Eulabetidae, which by many authors are not considered distinct. The only indigenous Australian starling is a member of the latter family, the members of which are known as shining or metallic starlings. Two of the true starlings have, however, been acclimatized, the European Starling (*Sturnus vulgaris*) and the Indian Myna (*Acridotheres tristis*). The starling is now spread all over South-eastern Australia from Adelaide to Rockhampton, and is steadily extending its range; its nests are, unfortunately, breeding-grounds for lice, and should be destroyed instantly if discovered near a human habitation. The myna is common about Melbourne and Sydney, and also round Townsville, Innisfail, and Cairns in northern Queensland; it was introduced to Queensland to combat the cane-beetle.

The Shining Starling (*Aplonis metallica*) is a spring and summer visitor to the Northern Territory and northern Queensland from Papua and the Moluccas. It is a dark-coloured bird with glossy plumage reflecting purple and green metallic tints and with a bright red eye; it is noisy and sociable in its habits, and feeds on scrub-fruits. Large numbers of nests are constructed on the branches of a single tree, which is sometimes covered with them. The nests are large oval structures, with the entrance at the side, suspended by a tapering portion. The two or three eggs are bluish-gray, with reddish markings, chiefly at the larger end.

W.B.A.

Stawell, SIR WILLIAM FOSTER (1815-1889), born in county Cork, Ireland, on 27 June 1815 and educated at the university of Dublin (B.A., 1837; hon. LL.D., 1874), studied law at King's Inn, Dublin, and at Lincoln's Inn, was called to the Irish bar in 1839 and in 1841 migrated to Australia along with several fellow-students of Dublin, including J. F. V. Fitzgerald (q.v.). He was admitted to the Port Phillip bar, and for some years combined legal practice with pastoral work, taking up a run in the Hamilton district in partnership with Fitzgerald. When in 1851 the colony of Victoria was established, Latrobe made Stawell attorney-general, and he soon dominated the government, both Latrobe and his successor Hotham yielding willingly to his guidance. His one set-back during these years was his unsuccessful prosecution of the Ballarat rioters (see EUREKA STOCKADE). He drafted the constitution act of 1854, which created the mechanism whereby Victoria was to enjoy responsible government; and, when at the end of 1855 the new system was inaugurated, Hotham formally accepted his resignation as attorney-general and the next day appointed him to the same position under William Haines as premier. In spite of a great outcry from meticulous constitutionalists this proceeding was confirmed at the first Victorian elections in 1856, and Stawell was returned by Melbourne to the legislative assembly. In February 1857 he resigned his seat and became the first chief justice of the colony. As a judge he was masterful but sound, very few of his judgments being reversed by the privy council; he also presided over a commission which drafted judicature acts assimilating Victorian law and practice as closely as possible to English precedents. On several occasions he administered the colony during a governor's absence, and in 1875 was bitterly attacked by George Higinbotham for refusing a dissolution to Graham Berry. In August 1886, he resigned the chief-justiceship and was succeeded in it by Higinbotham; in the following year he was formally appointed lieutenant-governor in order to retain his services as administrator whenever one should be required. In 1889 he returned to Europe to restore his shattered health, but died at Naples on 12 March.

Stawell's influence on his times extended far beyond his political and legal spheres. He was a staunch Anglican, and drafted for Bishop Perry the act that gave a synod to the Victorian dioceses. He was also a strong supporter of scientific work, exploratory and other; in 1858-9 was president of the Philosophical Institute of Victoria (see SOCIETIES, LEARNED) when the Burke and Wills expedition (see EXPLORATION BY LAND) was being prepared; was one of the original trustees of the public library of Victoria (1853-89), and chancellor of the university of Melbourne in 1881-2. (Kt. Bach., 1858; K.C.M.G., 1886.)

Steel. See IRON.

Steel, ROBERT (1827-1893), born at Pontypool in Monmouthshire on 15 May 1827 and descended from the family of Alexander Peden, the Covenanter, was educated at Ayr Academy, King's College, Aberdeen, and New College, Edinburgh. In 1852 he was ordained in the Free Church of Scotland as minister of Millport on the Clyde, and afterwards ministered at Salford, Manchester, and Cheltenham. In 1861 he was called to the Macquarie-street Presbyterian church in Sydney—afterwards St. Stephen's, Phillip-street—of which he was minister for 31 years. At the time of his arrival the union of the various Presbyterian denominations in New South Wales was being discussed, and it was mainly due to his advocacy that he was able on 15 November 1864 to move the Act and Declaration, thus making way for the Union, of which in 1867 he was the third moderator.

When in the sixties a Presbyterian college within the university of Sydney was proposed, he carried in the assembly (1866) a motion favouring it, and himself collected nearly half the funds required; when St. Andrew's College was established, he was elected to the council and remained a member till his death. For 25 years he was agent for the New Hebrides missions. In 1861 he was made Ph.D. of Gottingen and D.D. of Lafayette College, Pennsylvania. His influence was great and far-reaching;

wise statesmanship, generosity in debate, eloquence, versatility, and above all a high unselfish altruism, characterized his activities. He died at North Sydney on 9 October 1893. See PRESBYTERIAN CHURCH.

W.A.S.A.

Steel, THOMAS (1858-1925), born at Milton near Glasgow on 8 September 1858 and educated at the Greenock Academy and Collegiate School, in 1875 was made assistant chemist in a Greenock sugar-refinery. Rising to be chief chemist, he in 1882 accepted an appointment with the Colonial Sugar-refining Company of Sydney and migrated to Australia. For 11 years he was posted to its branch refineries, but from 1893 onwards worked at the head refinery in Sydney. He retired in 1918, and died on 17 August 1925. His chief interest outside his profession was the study of several branches of natural science. At Greenock he worked on the post-Tertiary clays of the district, and presented to the James Watt museum there a fine collection of local shells from those strata. In 1886 he joined the Linnean Society of New South Wales, of which he was a member of the council from 1897 and president in 1905-7. He was an authority on land planarians, fish otoliths, and *Peripatus*; he also wrote on the chemistry of Australian coal, and on levan, a new bacterial gum. In 1897 he was elected a fellow of the Linnean Society of London. He was president of the Field Naturalists' Society of New South Wales (1903-4) and of the Linnean Society of New South Wales (1905-6), chairman of the Sydney section of the Society of Chemical Industry (1910-11), and editor of the *Australian Naturalist* (1911-25). Before his death he transferred to the Australian Museum a valuable scientific library and extensive zoological and ethnological collections.

Stenocarpus, a genus of the family Proteaceae, consisting of trees; the three indigenous to Australia are all endemic. The flowers occur in short heads; corolla irregular, the tube opening along the inner side, lobes globular and recurved; fruit with a leathery coat; seeds winged; leaves alternate, entire to deeply divided. *S. sinuatus* (called Wheel-tree from the form, Fire-tree from the colour of the flowers), is a highly ornamental tree, attaining a height of 100 feet with a stem diameter of 3-4. The circular flower-heads are produced in great profusion, each with 12-20 bright red flowers radiating in a single row, like the spokes of a wheel, from the disk-like summit of the flower-stalk. The pale-coloured timber takes a good polish, and is suitable for veneers and cabinet-work, but the primary function of this remarkable tree is to be beautiful. *S. salignus* (Beefwood—a vernacular name applied to several proteaceous plants) is a tree of 40-50 feet with a stem diameter of 1-2 feet. Its flowers are greenish-white and fragrant, but not showy. Its reddish, fissile timber is used for furniture, gun-stocks, walking-sticks, picture-frames, etc. The two species described are found in New South Wales and Queensland; *S. Cunninghami* is a Northern species.

S. sinuatus.

Stephen, SIR ALFRED (1802-1894), born on 20 August 1802 at Basseterre in St. Christopher (West Indies), was in 1804 sent to England, and was educated at the Charterhouse and at Honiton grammar school. In 1818 he entered Lincoln's Inn, was called to the bar in 1823, and practised as an equity draftsman. In July 1824 he migrated to Hobart, was admitted to the local bar in February 1825, and on 25 April was appointed crown solicitor and solicitor-general; he organized courts of justice, framed statutes for the legislature, and advocated trial by jury—which was conceded in 1834. From 1833 to 1837 he was attorney-general of the colony. In 1839 he took Judge Burton's place temporarily on the supreme court bench of New South Wales, in March 1841, when Burton resumed duty, was made a puisne judge, and in 1844 was appointed chief justice. In 1856 he became president of the first legislative council under responsible government, but retired in November 1858. In 1870 he presided over a commission for revising the statute laws; its work was made law in 1883. In 1873, after 29 years' service, he retired from the chief justiceship, in March 1875 was nominated to the legislative council, and in November of the same year was made lieutenant-governor. His seat in the council was vacated from March to August 1879, and in November-December 1885, to allow him to administer the colony during absences of Sir H. Robinson and Lord Loftus; after these retirements he was immediately renominated to the council, but retired altogether in October 1890 to administer affairs in the absence of Lord Carrington. He died at Sydney on 15 October 1894. (Kt. Bach., 1846; C.B., 1862; K.C.M.G., 1874; G.C.M.G., 1884; P.C., 1893.)

Stephen, SIR MATTHEW HENRY (1828-1920), eldest son of Sir Alfred Stephen (q.v.), was born at Hobart on 5 December 1828, brought to Sydney in 1839, and educated at the Sydney College. Upon leaving school he was made associate to Chief Justice Dowling, but was soon sent to England for a year's legal study, and returned to become associate to his father. On 30 November 1850 he was admitted to the bar of New South Wales—the first native Australian to be admitted, and the first colonial barrister admitted under the colonial act. He several times refused the solicitor-generalship; in December 1869 he was elected by Mudgee

to the legislative assembly, but resigned in 1871. In 1880 he took silk and in 1887 was made a puisne judge. In 1902-3 he was acting chief justice, but retired at the end of 1903. He died on 1 April 1920. J.V.C.-B.

Stephens, JAMES BRUNTON (1835-1902), was born at Borrowstounness (usually mapped as Bo'ness) in Linlithgowshire on 17 June 1835, and educated at the university of Edinburgh, on leaving which he entered the teaching profession. Tiring of travelling tutorships and of schoolmastering in Scotland, he in 1866 came to Queensland and taught private pupils in Brisbane and on a Logan River cattle-station. In 1873 he entered the Queensland education department (being headmaster of schools at Stanthorpe and Ashgrove), was transferred by Sir T. McIlwraith in 1883 to the colonial secretary's office, and was chief clerk and acting under-secretary in that department when he died at Brisbane on 29 June 1902.

His one long poem, *Convict Once*, published in London in 1871, was the work of his Logan River days; though burdened with an awkward 'elegiac' metre and a confused plot, its dignified language and quality of imagination place it high among scholarly Australian verse. His popularity as a poet was gained mainly by purely farcical verse of the 'Chinee Cook' order. The best of his achievement—which was sometimes very good—is contained in the Children's Hospital verses (by which he himself wished to be remembered) and the two fine poems on 'The Dominion of Australia,' written in 1877 and 1900 respectively. The poem of 1877 ranks with John Farrell's 'O Radiant Land' as the acme of Australian patriotic poetry. His collected verse was published in 1885 as *Convict Once and Other Poems*, and republished with additions as *Poetical Works* in 1902; *Selected Poems* was published in 1925.

Sterculiaceae, a large and widely dispersed but chiefly tropical family of herbs, shrubs, and trees, more or less thickly coated with star-like hairs. Twenty genera with 156 species are indigenous to Australia. The few species of *Tarrietia* are confined to eastern Australia; *T. argyrodendron*, a tall tree, provides a valuable wood for the cooper, and is used as piles for wharves. *Heritiera littoralis* is a tropical sea-coast tree, extending from Queensland into northern Australia, where it is known as the Red Mangrove. It has a tough, durable wood, used in India for beams, planking, and posts, but chiefly for boat-building. *Ruelingia pamosa* has a useful timber, and yields a fair fibre. The aborigines use the bark fibre of *Commerconia echinata* for making kangaroo- and fishing-nets. *Thomasia*, which (with the exception of *T. petalocalyx*) is confined to Western Australia, consists chiefly of shrubs with clustered flowers, with minute or obsolete petals; the calyx enlarges and acquires a white or bluish colour. *Lasiopetalum* is also almost entirely a western genus; it has 35 species, mostly shrubs; flowers in small clusters with minute petals. See BRACHYCHITON.

Thomasia stipulacea.

Stevenson, George (1799-1856), born at Berwick-on-Tweed on 13 April 1799, went to sea at the age of 12 with his uncle (who was the master of an East Indiaman), but grew tired of the life and returned to Scotland to study medicine. He tired of that also and for some years wandered through western Canada, Central America, and the West Indies, and in 1830 went back to England and collaborated with Sir Henry Bulwer in a book on France. In 1835 he became editor of the *Globe* newspaper, to which he had contributed during his wanderings. But the scheme for founding a Wakefield colony (see WAKEFIELD, E. G.) in South Australia was then in the air; Stevenson became one of its most ardent supporters, resigned his editorship, and took a post as private secretary to Governor Hindmarsh, with whom he reached South Australia in December 1836. It was Stevenson who read the proclamation of the founding of the colony on 28 December.

Before leaving England he had arranged with Robert Thomas (See THOMAS, W. K.), owner of a printing-press, to bring out a newspaper in the new settlement, and the first issue of the *South Australian Gazette and Colonial Register* was made in London on 18 June 1836, the second appearing in Adelaide on 3 June 1837. Governor Gawler, however, withdrew the official 'gazette' notices from the paper—which thenceforth was known as the *South Australian Register*—and this loss of business and the financial crisis of 1842 led to its transfer to other proprietors, Stevenson resigning the editorship and shortly afterwards founding the *South Australian Gazette and Mining Journal*. That journal lasted until the difficult days of the first Victorian gold-rush. Stevenson, who was not wholly dependent on his press work (being, among other things, city coroner), died at North Adelaide on 18 October 1856. Outside journalism his chief interest was in horticulture, especially in the acclimatization of vines and other fruit-trees. A.D.A.

Stewart, NELLIE, born in Sydney in 1864, was the daughter of well-known theatrical artists. Her mother, Theodosia Yates, descended from the well-known Mary Ann Yates of David Garrick's time, had come to Tasmania in 1840 with Mrs. Clarke's company (see DRAMA) and had married another actor, James Guerin, by whom she had two daughters—afterwards known

to the theatrical public as Maggie and Docie Stewart. Nellie's father, Richard Stewart, arrived in Australia about 1853 to try his luck at the diggings; in 1857 he married Guerin's widow, took up stage management and became a successful comedian. While Nellie was still an infant, the family moved from Sydney to settle in Melbourne; there she made her first public appearance at the age of three with Charles Kean in *The Stranger*. From that time on she occasionally appeared in pantomime and opera-bouffe under her father's management, was carefully trained in singing, dancing, and fencing, and in 1877 took part in a medley entertainment, *Rainbow Revels*, written for the Stewart family by Garnet Walch. This was a success in Australia, and in 1879 the family took it on tour in India, England, and the United States. In April 1881 Nellie, who had developed a fine soprano voice and a charming stage manner, began her independent operatic career in George Musgrove's Adelaide production of *La Fille du Tambour Major*, and in December 1883 was made leading lady in Gilbert and Sullivan's *Patience*. In 1884-7 she played continuously in comic opera (taking 21 principal rôles) under the management of Williamson, Garner, and Musgrove, touring Australia and New Zealand; in March 1888 she appeared in grand opera as Marguerite in Gounod's *Faust*. When Musgrove again undertook independent production, Nellie Stewart was his star, appearing with Marian Burton in *Paul Jones* (Melbourne, 1889) and *Blue-Eyed Susan* (London, 1892), and in 1893-5 heading a comic opera company through Australia and New Zealand. In 1895 she returned to London, but *The Scarlet Feather* was a failure, and she made no further appearances until the Drury Lane pantomime of 1899-1900. In 1901 she came back to Australia, where she sang the Memorial Ode at the opening of the first Commonwealth parliament. On 15 February 1902 she appeared in the name-part of *Sweet Nell of old Drury*, which for a fortnight trembled on the brink of failure, but thenceforward was reckoned among her greatest successes. *Sweet Nell* was followed by *Mice and Men*, *Zara*, and *The Country Mouse*, and at the end of 1905 the company entered on a tour of the United States; but its plans were upset by the San Francisco earthquake and the tour was financially a failure. After another resting period she visited Australia again in 1910, making *Kitty Bellairs* the chief feature of her season and appearing as Rosalind in *As You Like It* and as Maggie in *What Every Woman Knows*. Since that time her appearances have been made at long intervals. A season played in 1914-15 was unfortunately coincident with the early war period, and of late years she has been seen only in benefit performances for charities. In April 1926 she gave a performance of *Sweet Nell of Old Drury* which realized about £1500 for a Sydney charity, and in June eight consecutive performances in which she played the title-rôle with undiminished verve.

See her autobiography *My Life's Story* (Sydney, 1923).

Stick-insects and Leaf-insects, a group of large insects of the family Phasmidae and order Orthoptera, which have their headquarters in Australia. More than 100 Australian species have been described. The resemblance to sticks or leaves which gives them their name is obviously protective. *Palophus titan*, which has a body 10 inches long and an expanse of wing about the same, is a denizen of northern Queensland, where other large species occur. One of the commonest species in the gregarious and handsome *Podacanthus wilkinsoni* (plate xix, fig. 2), which frequently does much damage by stripping forest trees of their leaves. Other interesting phasmids are the spiny, leaf-mimicking *Extatosoma tiaratum* and the slender stick-insects of the genus *Bacillus*. Phasmids have so far shown little taste for cultivated plants, though one large species of *Acrophylla* eats orange-leaves. A curious wingless species, the Tree-lobster (*Karabidion australe*), lives on Lord Howe Island in communities in hollow tree-trunks. The amount of food such communities eat must be considerable, as the droppings at the base of an inhabited tree would often fill a large tub. See ORTHOPTERA. R.J.T.

Stilts. See WADERS.

Stingaree. See STING-RAYS.

Stinging Tree. See LAPORTEA.

Sting-rays or **Stingarees,** a large group of rays (*Dasyatidae*) having the tail armed on the upper surface with one or more serrated spines which can inflict very dangerous wounds. In large specimens these spines may reach a length of 12 inches. They have coarsely serrated edges, and a grove on each side containing venom-secreting cells; they are wielded with great force by the ray, and leave jagged wounds which, in man, readily result in blood-poisoning. Sting-rays are very plentiful both in shallow waters and in the depths. They are taken in considerable quantities by trawlers, and their pectoral fins (wings) are commonly sold in the markets as skate, being esteemed a delicacy by those who approve of their rather gelatinous consistency. Two large species, *Dasyatis brevicaudatus* and *D. thetidis*, which are not uncommon off the coasts between Tasmania and southern Queensland, sometimes reach a width across the disk of almost six feet, and

Urolophus testaceus.

are commonly called 'black skate;' it was one of these species whose capture is recorded in Captain Cook's *Journal* for 5 and 6 May, 1770. Several specimens weighing over 240lb. were secured; this so impressed him that in his log, he named the locality 'Sting rays harbour' but the great number of plants secured by Banks and Solander caused him to alter it in his journal to Botany Bay. Other smaller kinds, such as the Green-back (*Urolophus viridis*) and Sandy-back Stingaree (*U. bucculentus*), are very plentiful in depths of 40-80 fathoms, whereas the Common Stingaree (*U. testaceus*) occurs on sandy flats in harbours and estuaries. An ornate species in the tropics is the Blue-spotted Stingaree (*Dasyatis kuhli*), which is a striking object as it moves over sandy lagoons of coral-reefs in search of food. Other striking members of the family include the Rat-tailed or Butterfly Ray (*Pteroplatea australis*), in which the disk is expanded laterally into broad angular wings, making it much more broad than long. The tail is very short and contrasts greatly with that of the Coachwhip Ray (*Himantura uarnak*), in which it is produced into a slender cord-like member, sometimes four times as long as the body. In the Feather-tailed or Cow-tailed Ray (*Pastinachus sephen*) the skin is covered with coarse granules, and the tail is provided with a broad dermal membrane below, which makes it appear like a long feather. Both these are widely distributed in the tropics, and occasionally stray southward into New South Wales waters. They attain a width of five to six feet across the disk.

A.R.McC.

Stinkwood. See ZIERIA.

Stinkwort. See NOXIOUS PLANTS.

Stint. See WADERS.

Stirling, SIR EDWARD CHARLES (1848-1919), born at Strathalbyn in South Australia on 8 September 1848 and educated at St. Peter's College, Adelaide, Trinity College, Cambridge (B.A., 1869; M.A. and M.B., 1872; M.D., 1881), and St. George's Hospital, London (F.R.C.S., 1874), returned to Adelaide in 1881 to be senior surgeon at the Adelaide hospital and lecturer on clinical surgery at the university; in 1882 he became lecturer on physiology and in 1900 professor. From the first he took a prominent position in public life, and for four years (1884-7) represented North Adelaide in the legislative assembly; in 1890 he was president of the Royal Society of South Australia; in 1893 he was made a fellow of the Royal Society of London, and the next year accompanied the Horn expedition to central Australia, subsequently writing a report on its ethnological discoveries. In 1888 he had made known to science the marsupial mole (q.v.). He was on the governing bodies of many important institutions, including the university, the museum (of which from 1885 onwards he was honorary director), the public library and art gallery, the Zoological Society, and the Adelaide hospital. Nor was his connection with these institutions a formal matter; to all he devoted himself by serious and valuable work. His numerous and important contributions to scientific journals included first descriptions not only of the mole mentioned above but of *Diprotodon Australis* (see PALAEONTOLOGY), certain fossil birds, and other discoveries. He died at Mount Lofty near Adelaide on 20 March 1919. (C.M.G., 1893; Kt. Bach., 1917.)

Stirling, SIR JAMES (1791-1865), born in January 1791 at Drumpellier in Lanarkshire, Scotland, entered the navy in August 1803 (lieutenant, 1809; commander, 1812; post-captain, 1818; rear-admiral, 1851; vice-admiral, 1857; admiral, 1862), and in 1803-4 served in the West Indies; then, joining his uncle Admiral Charles Stirling, he was with him in the battle off Cape Finisterre of 22 July 1805, in the operations along the Rio de la Plata in 1807, and in the West Indies again in 1811. Given command of the sloop *Brazen*, he shared in the naval war in the Atlantic until the peace of 1815, and remained with her in the West Indies until 1818.

In April 1826 the colonial office decided to plant a settlement on the mainland of northern Australia, and Stirling was given command of H.M.S. *Success* with orders to choose a fitting site, transfer a small garrison thither from Sydney, and remain in the neighbourhood for a time to ward off attacks by Malay pirates. Reaching Sydney in December, he found that nothing could be done in the north until the rainy season was over, and occupied himself in the meantime with a visit to the Swan River on the western coast; there, he explained to Darling at great length, was the best possible situation for a naval and military station which would 'at the same time command India, the Malay Islands, and all the Settlements in New Holland....prevent or counteract any hostile views, entertained by an enemy upon India,' and provide an excellent convalescent station for Anglo-Indian troops. In April 1827 Stirling returned to Sydney full of enthusiasm for the Swan River region, and in May applied to the colonial office for appointment to superintend a settlement there; this failed, as in 1827 the British government was not inclined to extend its responsibilities. On 19 May Stirling proceeded to northern Australia, in June selected Raffles Bay as the best site for a settlement (see NORTHERN TERRITORY), and on 23 July left for England. In July 1828 he once more made representations regarding Swan River to the colonial office, which had just come under new administrators; as a result, orders were given in November for the annexation of the region, and at the end of the year it was decided to send Stirling back to form a settlement. On 1 June 1829 he reached the Western Australian coast, landed on the mainland on the 18th, and fixed the sites of Fremantle and Perth. By the end of the year 18 vessels had brought settlers to the new colony, and the population numbered 1290, of whom 850 were permanent settlers. At first Stirling was lieutenant-governor with absolute power, but in 1831 was given a legislative and an executive council, and was made governor and commander-in-chief. In 1832-4 he visited England at the request of the colonists to represent their grievances in person to the British government. In June 1834 he returned, and devoted himself to the colony from that time till his resignation in January 1839. Then he returned to England, re-entered active service, commanded battleships in the Mediterranean in 1840-4 and 1847-50, was a lord of the admiralty for a short time in 1852, and commander-in-chief in the East Indies and China in 1854-6. He died at Guildford in Surrey on 22 April 1865. (Kt. Bach., 1833.)

See J. S. Battye's *Western Australia* for a detailed account of Stirling's administration.

J.S.B.

Stirling, SIR JOHN LANCELOT (younger brother of Sir E. C. Stirling), born at Strathalbyn on 5 November 1849 and educated at St. Peter's College, Adelaide, and Trinity College, Cambridge (B.A. and LL.B., 1871), was called

to the bar at the Inner Temple in 1871, returned to Adelaide in 1876, and in 1881 entered politics as representative of Mount Barker in the legislative assembly. In 1888 he was elected for Gumeracha, and in 1891 was sent by the Southern District to the legislative council. In 1901 he was made president of the council. His chief interests, however, have always been pastoral, and he was president of the Pastoralists' Association of South Australia, and of the Agricultural Society: his sports record includes the amateur hurdles championship of England (1870, 1872), five years' mastership of the Adelaide hounds, and the captaincy of the Adelaide polo team. (Kt. Bach., 1902; K.C.M.G., 1909; O.B.E., 1918.)

Stirling Castle, THE, a brig of 500 tons, left London on 22 October 1835 for Hobart; she arrived on 22 March 1836, landed some passengers, discharged part of her cargo, and went on to Sydney. She left Sydney in ballast on 15 May and on the 21st struck the Eliza reef (now known as Swain reefs) east of Port Bowen, Queensland. The master, James Fraser, who was in bad health, had four years previously been wrecked on the same coast in the *Comet*. When the ship began to break up, Fraser and his wife and the 16 officers and crew took to the boats, 11 in one and 7 in the other, and made for the mainland. They had some provisions and water, and believed that they were in no danger, provided they kept together as a defence against the blacks. After five days they reached Cumberland Island, where they repaired the leaky boats and re-embarked, but the weather was such that it was 29 July before they reached the mainland. For a week they had been almost without food or water, and before landing Mrs. Fraser was delivered of a child, which died a few minutes after its birth and was buried at sea. The boat leaked so badly that it was difficult to keep it afloat. Baxter, the second mate, was in charge of the small boat, but became so ill that he was taken into the other—Stone, the boatswain, taking his place. During the night the boats parted company, and Stone and his party subsequently landed a long way to the south near Clarence River, where they fell in with a tribe of blacks; only one (Hodge) survived to tell the story. Two boys (Fraser and Wilson) were drowned, Stone and the carpenter, Schofield, were killed by the blacks, Major, a seaman, was burnt to death, Allen, the cook, and Copeland, a seaman, died of exposure and the hard work the natives made them do; Hodge survived only because of his great physical strength. Those in the long-boat reached the mainland, made a tent with the sail, and held a council as to what next to do, for in the distance they saw a party of blacks watching them. On the third day the natives supplied them with fish in return for clothing, but by the 11th day their clothing was nearly all gone and it was apparent that the blacks were becoming hostile. The long-boat was still in a bad state, bottom up on the beach, and a strong wind from the sea made it practically impossible to re-embark in her. After some consultation Darge, Youlden, Hanham, Elliott, and a boy named Carey decided to attempt to walk along the beach to Moreton Bay, leaving Captain and Mrs. Fraser, Brown the chief and Baxter the second officer, Corallis the steward, and Doyle a seaman. They divided their few possessions, leaving the captain and Doyle a pistol apiece and some ammunition, Baxter a musket, and the steward a big stick. As soon as Darge's party left, the blacks came down in great numbers and within a few days separated them, ultimately killing most of them. Mrs. Fraser was present when her husband was speared to death and Brown the mate roasted, and she herself suffered terrible indignities. These horrors took place about 12 miles from Sandy Cape and about 100 from the settlement at Moreton Bay. One day in their wanderings the survivors met, but after a greeting had passed between them, their captors separated them again. Three of their number escaped and made their way to the settlement, and Captain Fyans, the commandant, promised Otter, a convict, his liberty if he brought the others in. The convict, who knew the ways of the blacks, went out and brought in Mrs. Fraser, Baxter, Robert Carey (a boy who was afterwards apprenticed to a boat-builder in Sydney), and Robert Hanham. They were all taken to Moreton Bay, and when sufficiently recovered, to Sydney. Of the crew three had been speared, two burned, four drowned, two starved, and eight were saved. Otter stated that when he rescued Mrs. Fraser she looked 70, although only 38. She was entirely without clothing, and almost black.

W.J.

Stirlingia, a small genus of the family Proteaceae, with 5 species endemic in extra-tropical Western Australia. The conformation of the anthers in this genus makes it a connecting link between the two large sections (Proteae and Conospermeae) of the family. The flowers are small, in globular heads; corolla-tube cylindrical, separating into distinct segments recurved above the middle; anthers perfect, erect on short thick stalks at the base of the corolla-lobes (each anther is separated from its neighbours by a broad connective, and the adjoining cells of two adjoining anthers are applied face to face in the bud, so as to form a single cell); fruit a small, flat-topped nut, covered with hairs.

Stone, SIR EDWARD ALBERT (1844-1920), second son of George Frederick Stone, one-time attorney-general of Western Australia, was born on 9 March 1844 and educated at Chigwell in Essex, England. In 1860 he was appointed clerk to the attorney-general, was called to the Western Australian bar in 1865, and from 1870-4 was clerk of the legislative council. He acted as attorney-general in 1879, was appointed crown solicitor in 1881 and acted as chief justice, becoming puisne judge of the supreme court in 1884. He acted again as chief justice in 1887, 1889, 1890, and received the appointment on the resignation of Sir A. C. Onslow in 1901. He was knighted in 1902, and in 1906 retired from the chief-justiceship and was appointed lieutenant-governor. He died on 2 April, 1920. (Kt. Bach., 1902; K.C.M.G., 1912.)

Stone-fishes, a small group (Synancejidae) which includes some of the most venomous fishes known. A common species in Australian waters inhabits coral-reefs, and has a remarkably shaped head and body, resembling a piece of eroded stone. It is variously tinted and marked, so as to appear like a fragment of rock covered with marine growths, and is so difficult to detect, when lying perfectly still in a coral pool, that it may be easily grasped or trodden upon unawares. Its wrinkled and warty skin hides needle-like spines, a prick from which causes intense agony and may be followed by

convulsions and death; the spines are provided with venom-glands, and grooves on each side convey the poison to their tips. The aborigines of certain parts of Queensland have a ceremony in which wax models are used to teach the younger boys the danger of treading upon stone-fishes when wading upon reefs in search of food. Several species of stone-fish are known from Australian waters, all restricted to the tropics. Notwithstanding the venom-glands, their flesh is said to be good eating when the glands and spines are removed. A.R.McC.

Stone-flies. See PERLARIA.

Stone-plovers. See WADERS.

Stony Desert. See EXPLORATION BY LAND.

Storks. See IBISES, SPOONBILLS, AND STORKS.

Stork's Bill. See GERANIACEAE.

Stow, THOMAS QUINTON (1801-1862), born at Hadleigh in Suffolk on 7 July 1801, at an early age determined to enter the Church, and for some years studied at the missionary college at Gosport. Admitted to the Congregational ministry in 1818, he served at Framlingham in Sussex, at Buntingford in Hertfordshire, and at Halstead in Essex. In 1837, under the auspices of the Colonial Missionary Society, and on the recommendation of G. Fife Angas (q.v.), he left Halstead for the newly formed colony of South Australia, and on 16 October landed in Adelaide. The society had provided him with a field-officer's marquee, which he pitched on the park lands, holding his first service on 19 December 1837. After a time he set about the erection of an unpretentious building, with walls of old sail-cloth, on an acre grant in North-terrace—the first church built in South Australia. On 1 November 1840 this temporary place of worship was replaced by a more substantial structure in Freeman-street, and here Stow ministered for many years, retiring in September 1856 after a pastorate of 19 years in all. While fulfilling a temporary engagement in Sydney, he died on 19 July 1862.

In the critical years of South Australia's early growth Stow played no unimportant part. Able, energetic, and courageous, he fought hard for religious liberty, and was one of the leaders in the long struggle (which in 1851 ended as he desired) against state air to religion. After his death a memorial church was erected in Flinders-street, Adelaide, by public subscription. See CONGREGATIONALISTS. F.V.P.

Strahan, SIR GEORGE CUMINE (1838-1887), born in 1838 and educated at the royal military academy, Woolwich, joined the royal artillery in 1857 (lieutenant, 1857; captain, 1871; major, 1874), but found his chief employment in the colonial service. From 1859 to 1864 he was aide-de-camp to the high commissioner of the Ionian Islands; in 1868-9 he was chief secretary at Malta, in 1869-73 secretary and acting-governor in the Bahamas, in 1873 administrator at Lagos, in 1874-6 governor of the Gold Coast, in 1876-80 governor of the Windward Islands. In 1880 he was appointed governor of Tasmania, but took over the acting-governorship of The Cape Colony on his way out, and did not reach Hobart till 7 December 1881. His health, however, already impaired by long residence in the tropics, could not be restored. Retiring on 28 October 1886, he died at Bournemouth on 17 February 1887. (C.M.G., 1875; K.C.M.G., 1880.)

Strangways, HENRY BULL TEMPLAR (1832-1920), born at Shapwick in Somerset in 1832, visited South Australia while still a boy, but returned to England, entered at the Middle Temple in November 1851, and was called to the bar on 6 June 1856. Returning to South Australia in May 1857, he was admitted to the local bar in 1859. Entering politics in 1858 as representative of Encounter Bay in the legislative assembly, he was in 1859 asked to form a ministry when the Hanson ministry of the time was in difficulties, but felt himself too inexperienced for the task; in 1860, however, he joined the Reynolds ministry as attorney-general, became commissioner of crown lands in the second Reynolds ministry (1861), and resumed that position in the Waterhouse ministry of 1861-3 and the Dutton and Ayers ministries of 1865. In 1868-70 he headed a ministry of his own, but soon after his defeat in 1870 abandoned politics and went back in 1871 to England, where he lived on the family estate at Shapwick until his death in 1920. Although his periods of office were comparatively short, Strangways managed to crowd into them a great deal of useful work. He actively promoted the construction of state railways, was a prime mover in the decision to construct the overland telegraph-line (though the actual construction was done after he left the colony), and carried through parliament an act that opened up large agricultural areas to settlement on terms previously unknown in South Australia, roughly corresponding to those of the Robertson land acts in New South Wales (see LAND LEGISLATION).

Streeton, ARTHUR, born at Bellarine near Geelong in Victoria on 8 April 1867, studied at the national art school in Melbourne. Tom Roberts was the first to introduce impressionism in Australia, but it was the influence of Streeton that led to the creation of an Australian school of landscape-painting. In 1897 he visited London and exhibited at the principal exhibitions in England and on the continent. He was awarded a *Mention Honorable* (1892) and the medal of the third class (1909) at the Old Salon, and at the Carnegie Institute in 1913 he was awarded an Honourable Mention. He is a member of the Royal British and Colonial Society of Artists and the Royal Institute of Oil Painters. He is represented in the Glasgow, Sydney, Melbourne, Adelaide, Bendigo, Geelong, and Castlemaine galleries; the Carnegie Institute, Pittsburg; the Imperial War Museum, London; and the Australian War Museum. He was an official artist with the A.I.F. in France. Julian Ashton says of him:

> Streeton has undoubtedly been a powerful influence, not only upon the work of his contemporaries, but upon many a budding artist who will eventually add lustre to his craft. And that influence has been a purely wholesome one. He was not troubled with any of the deep underlying problems of paint; the outward aspects of nature in sunlight were all he sought, and the mastery of a technique which would suggest these qualities in the simplest, most direct and natural manner was what he most seriously desired. He was on the high road to so great a success when he decided to shift his viewpoint to an alien soil, that his technique, even then, almost amounted to a tradition. But on that foreign soil, so saturated with formulas, his true purpose could not be fulfilled. For all that, he takes high rank in the small band of Australians who have gained recognition for Australian art in the older civilizations of the world.

Among his best-known works mention may be made of 'Still Glides the Stream' and 'A Cre-

morne Pastoral' (Sydney gallery), 'The Hawkesbury River' (Melbourne gallery), 'Australia Felix' (Adelaide gallery), and 'Golden Summer' purchased by a collector for £1000, the record price for an Australian landscape. After several trips abroad the artist settled at Mount Olinda, Victoria. See ART.

See *The Art of Arthur Streeton* by Julian Ashton, Lionel Lindsay, and P. G. Konody (Sydney, 1919). W.M.

Strickland, SIR GERALD, born at Valetta in Malta on 24 May 1861 and educated at Oscott College, Birmingham, and Trinity College, Cambridge (B.A., LL.B., 1887), was called to the bar in 1887 and for a time practised before the privy council. In 1886 he was made a member of the Maltese executive council, in 1887 was president of the Malta cholera committee, in 1888 assistant-secretary to the Maltese government, and in 1889 chief secretary; in that year he established the royal Malta militia, of which he was the first major. In 1900 he became president of the council of the university of Malta. In 1902 he was made governor of the Leeward Islands in the West Indies, and established factories for sugar and cotton in Antigua in 1903. He was then successively governor of Tasmania (1904-9), Western Australia (1909-12), and New South Wales (1913-17). A man of great administrative ability, he was impatient of less able administrators, and over-inclined—for a governor of a self-governing State—to use his personal influence in local politics. This fault was of minor importance in Tasmania and Western Australia, where politicians usually welcomed expert assistance; but in New South Wales, where they did not, it led to friction. In 1916 Strickland disagreed with his advisers (the Holman ministry) on a constitutional question; he therefore in November dismissed Holman—as he was entitled to do—but had omitted to provide himself with an alternative set of advisers; finding no other politician to undertake the premiership, he (since the governor can only act through a premier) was forced to recall Holman and accept defeat on the question at issue between them. Early in 1917 the colonial office, which just then was extremely anxious to avoid any friction with colonial ministries, recalled Strickland, and, though he was a most valued official, gave him no more work. In 1921 he was elected to the Malta legislative assembly, and in 1924 was sent by Lancaster to the house of commons. (K.C.M.G., 1897; G.C.M.G., 1913.)

Strikes. In 1822 an assigned convict in the Liverpool district of New South Wales incited his fellow-servants to combine for the purpose of securing higher wages and increased rations, and in 1824 in Sydney several coopers 'conspired' against their employer's interest and attempted to prevent other mechanics from going on with their work; but it is not known whether in either instance the employees actually went on strike. In November 1829 a number of compositors in Sydney actually struck, and the publication of the *Australian* was suspended; from that time there is a continuous record of disputes leading to industrial dislocation. Until 1907 (for New South Wales—1913 for the rest of Australia), however, no official information was compiled as to the cause of strikes or lockouts, the number of people directly involved, the number of working-days and amount of wages lost, and the result. It is therefore usually impossible to measure the economic and social effects of the earlier disputes, and very difficult to secure reliable information concerning them. This article deals only with the few outstanding industrial dislocations before 1907 which have for one reason or another become historic; further information about early strikes will be found under TRADE-UNIONISM.

The first strike with intercolonial ramifications was that of the Seamen's Union against the Australasian Steam Navigation Company in 1878. About the middle of that year the company engaged Chinese on some of their vessels trading with the islands; in November, intending to use them also on the Queensland run, it brought about 100 to Sydney in the *Ocean*. The union, alarmed at the prospect, called out its members in the company's employ as their vessels reached port. The company's extended service was soon dislocated—17 vessels being tied up within a short time—though some sailings were maintained, chiefly by the help of Chinese crews. The strikers received financial support from other unions in Australia and New Zealand, and from the general public as well; the coal-miners refused to supply coal to the company, and the Queensland government announced that it would not continue its mail-subsidy while coloured labour was employed. In January 1879 a settlement was effected, the company agreeing not to retain more than 180 Chinese—to be reduced to 130 within a period of three months. The last of the Chinese crews was discharged on 1 September 1882.

The strikes that occurred during the eighties were local in effect, but two have special interest. In 1882 in Melbourne there was a strike of women in the tailoring industry—the first occasion on which Australian women were directly concerned in an industrial dispute. The strike was financed and controlled by the executive of the trades-hall council, the sweating that obtained in the industry was revealed, and both increased wages and better conditions were secured. Investigations made at this time led to the appointment of a commission on sweating. In 1886 the Melbourne wharf-labourers went on strike for increased wages and better conditions. After 18 days it was agreed that the questions in dispute should be submitted to arbitration, the arbitrators representing the Employers' Union and the trades-hall council, with Professor Kernot of the university of Melbourne as an independent chairman. The award—probably the first arbitration award in Australia—favoured the strikers.

By 1890 trade-unionism was apparently strongly entrenched, and the workers determined to resist any attempt to decrease wages or weaken their organization, but found themselves handicapped by falling receipts and increasing unemployment. Just at this time, amid a general restlessness, the maritime strike occurred. The marine officers engaged in the intercolonial and coasting trade had formed a Marine Officers' Association, and asked for a conference with shipowners to consider their grievances—lack of accommodation for junior officers, and inadequate pay. Meanwhile the Melbourne branch had linked up with the trades-hall council, and the shipowners refused to meet the association unless, in the interest of discipline at sea, it dissociated itself from the other maritime unions. The officers, backed by the unions, refused these terms, and on 15 August gave notice of their intention to leave the ships. The situation was complicated by grievances in New South Wales

and Queensland connected with the shipment of non-union wool; in Queensland there was also a dispute between shipowners and seamen. On the 16th seamen in the intercolonial and coastal service were ordered by their union to give notice; on the 19th wharf-labourers were withdrawn, and preparations were made for a widespread upheaval. In Sydney a committee of defence was formed by representatives of the trades-and-labour council, the maritime council, and other unions directly concerned; in Melbourne a committee of finance and control was set up, and in the other colonies local councils dealt with specific questions as they arose. It was soon found necessary to appoint an intercolonial committee to organize the strike, and this sat continuously in Sydney—the strike-centre—from 12 September until a settlement was effected. Owing to the refusal of the Newcastle miners to supply coal to 'black' ships, the colliery proprietors closed their mines, and this was followed by the cessation of work on other fields; there was also a temporary stoppage at Broken Hill and Lithgow. On 19 September instructions were sent to the New South Wales shearers to cease work the following week. This step was a tactical mistake, since it deprived the maritime unions of much financial support, and involved the shearers themselves in serious losses; on 2 October, therefore, after the pastoralists had agreed to a conference—which, however, did not meet—they were ordered back to work. The maritime unions, though well supported financially by their fellow-unionists and the general public in Australia and New Zealand, and also by unions in England, were greatly handicapped by the increasing unemployment, which provided non-union workers for the shipowners. Moreover unionists in the other colonies severely criticized the conduct of the strike in Sydney, and the local councils began to act without the knowledge or sanction of the central committee. As there had been a considerable amount of street-fighting in various centres, the governments had taken steps to protect non-union workers, especially on the coal-fields. The shipowners refused to treat with the organizing strike-committee, but agreed before the end of October to negotiate with the marine officers, who were now prepared to dissociate themselves from the union movement; a resumption of work was arranged, the coal-miners returned to work, and the seamen's union had to admit a defeat. This struggle cost the unions about £190,000, apart from loss of wages. After the settlement in New South Wales Henry Parkes appointed a royal commission to inquire into and report on the question of strikes; in its report (presented on 22 May 1891) the only practical suggestion was for the formation of a board of conciliation and arbitration.

Hardly was the maritime dispute terminated when trouble occurred in the shearing industry. In 1890 Queensland pastoralists on the Darling Downs had decided to employ non-union labour, and a beginning was made on Jondaryan station; the Australian labour federation at once took action to prevent the shipment of non-union wool, and the pastoralists agreed to give preference to unionists. Meanwhile the dispute had followed the shearing-season south, the maritime strike intervened, and the shearers, after involving themselves in that dispute, returned to work with depleted funds to face legal actions and victimization. In 1891 the Queensland squatters, backed by those in New South Wales and Victoria, decided to enforce an agreement which involved 'freedom of contract' with individual employees. The shearers decided not to sign on under an agreement which ignored the union, and the squatters retaliated by recruiting non-union labour. Trouble began at the Logan Downs station in central Queensland, where unionists formed a camp and endeavoured to intercept non-unionists on their way to the sheds. The trouble spread as the season advanced; some leaders were arrested and sentenced to various terms of imprisonment for intimidation, conspiracy, or rioting, and the government sent mounted police and troops to the disaffected area to prevent disturbances. Shearing was completed mainly with non-union labour. The dispute had threatened to extend to the southern colonies, but a conference was arranged, the union agreed to allow non-union and union labour to work together, and a compromise was effected on such questions as hours of work, shearing wet sheep, etc. This agreement was adopted in Queensland also, and remained in force until April 1894, when the squatters decided to draw up new terms. The Queensland unions and the Australian Workers' Union (which represented shearers and shed-hands in New South Wales and Victoria) prepared to resist, but they had no funds, their request for a conference was refused, and the squatters declined to use the machinery provided for voluntary arbitration. Shearing was begun with non-union labour. The unionists, as before, formed camps near the stations, which (since most of the men were armed) were centres of disturbance. Many sheds were fired; many strikers were arrested and sentenced to terms of imprisonment. In Queensland—where, according to the colonial secretary, the strike had developed into an insurrection—an act for the better preservation of the peace was passed; it provided that within proclaimed areas the carrying of fire-arms was permitted only on specified conditions, and that any person attempting to disturb law and order, or suspected of acts of violence, might be arrested, held without bail, and sentenced to a fine of £100 or imprisonment for not more than three months. Fortunately the official charged with enforcing this act was tactful, and always succeeded in dispersing the strikers without bloodshed. Throughout the eastern colonies the strike was a complete failure, and left the men's unions powerless and moneyless. Not until 1904, when the Amalgamated Workers' Association of Queensland (which included the shearers' and other bush-workers' unions) joined with the Australian Workers' Union, was a return to the membership of the early nineties effected; and then action under the arbitration system was found to be more effective than strikes.

In 1902 there was much trouble in the mining industry at Broken Hill. After the stoppage of work in 1890 an agreement was arrived at whereby both parties undertook to accept as final the decisions of an arbitration board, and the miners undertook not to concern themselves in any dispute foreign to the mines; contracts (other than for the stoping of ore) were to be allowed as heretofore, stoping being done by day labour. On 30 June 1892 the companies gave a month's notice that they proposed in future to carry on stoping by contract. The miners, about 5000 of whom were involved, asked for arbitration under the 1890 agreement; this being refused, they decided to cease work, as they were convinced that the owners had determined to break the control of the Amalgamated Miners'

Association and secure 'freedom of contract.' The owners gave the men until 25 August to return to work, and then made preparations to introduce non-union labour. The miners instituted picketing, and there were many disturbances; the strikers' defence committee was arrested on a charge of conspiracy, and six of its members were sentenced to various terms of imprisonment. On 6 November the strike was declared off, the owners' terms being accepted; but many men found it impossible to get employment again, and there was great distress throughout the district—which was partly alleviated by the issue of free railway passes to other places. The weakness of the trade-union movement during the nineties was shown also by the failure of a seamen's strike in 1893 and a strike of Newcastle coal-miners in 1896.

A shearers' strike in 1902 might have become serious but for the action of W. M. Keogh of Warrana station, near Coonamble, in New South Wales. Union shearers had formed a camp at Coonamble, and intercepted a large party of non-unionists who were being brought to Warrana under escort of a number of pugilists. Keogh thereupon applied for an injunction against picketing, and this was granted on 29 August by the chief judge in equity; breaches of the injunction occurring shortly afterwards, on 5 September Keogh obtained a rule *nisi* for sequestration of the union's property, and this put an end to the strike. The first important strike of the century was that of the Victorian railwaymen in 1903. In 1902 a depleted treasury had occasioned general retrenchment in the Victorian public service, causing much dissatisfaction among the State's employees. Early in 1903 four unions connected with the railway service affiliated themselves with the trades hall, despite the opposition of the railway commissioners, who subsequently ordered the executives to withdraw their affiliation or suffer dismissal from the service. At midnight on 8 May the engine-drivers and firemen in the commissioners' employ left their engines wherever they happened to stand, and for several days only a few suburban trains were run, though the service was gradually improved, from day to day, with the assistance of non-union labour. The government (urged by its minister of railways, Thomas Bent, q.v.) promptly introduced a bill which provided for the forfeiture by the strikers of all pension rights and retiring allowances, as well as of all legal rights previously secured to them in virtue of their position in the service; power was given the commissioners to reinstate strikers and restore their rights, but they might also engage persons taken on during the strike. Many non-labour members of parliament objected to this, and endeavoured to effect a more favourable settlement. After nine days the strikers indicated their willingness to return to work unconditionally, but the government pushed the bill through all its stages, and, though most of the men were re-employed, they suffered under the act for a number of years.

Another strike within the public service occurred in New South Wales in 1908, when the tramwaymen were called out as a protest against a 'system of espionage' carried on by inspectors in plain clothes. The resultant strike, which extended to the tramway services at Newcastle and Broken Hill, lasted six days only, partly because heavy rain made the lack of tramway services very inconvenient to the general public, partly because the railway employees refused to be drawn into a 'sympathetic' strike. The matters in dispute were referred to a special board.

At the end of 1908 an arrangement was made between the local branch of the Amalgamated Miners' Association and most of the Broken Hill mining companies to continue a working agreement arrived at in 1906. Two companies —the Proprietary and Block 10—refused to comply, and closed their works on 1 January 1909. The matter in dispute was referred by the men's representatives to the Commonwealth court of conciliation and arbitration, which issued an award in March; against this the Proprietary Company appealed to the high court, on the ground that the arbitration court had exceeded its jurisdiction. The high court allowed the appeal, and eliminated some technically irrevelant clauses of the award, but made no alteration in the principal award—which as regards rates of pay, favoured the men. The strike ended on 31 May, but the Proprietary Company refused to carry on operations on the former scale, no ore-winning operations underground being undertaken during the year. As a result only 500 men, out of 2600 originally employed, were taken back in June. About 3000 employees had been affected by the dispute, with a loss of 287,500 working-days and £266,000 in wages. During the strike several of the leaders (including Tom Mann, a visiting socialist, who assisted in the conduct of the strike) were arrested for alleged rioting, and the authorities arranged to have the case tried at Albury instead of at Broken Hill, where public feeling was very much inflamed. Three strikers were sentenced to various terms of imprisonment, Mann being among those acquitted.

In November 1909 began a serious strike among the coal-miners. The owners of the northern (Newcastle and Maitland) collieries were very reluctant to accept the industrial legislation of 1908 (see INDUSTRIAL LAW), and were rebuked by the industrial court therefor; their employees, persuaded by the same men who had organized the tramway and Broken Hill strikes that legal remedies for their many minor grievances were unavailable, struck work and declared that the fight would be one for complete mastery of the industry. Somehow they induced the miners of the southern and western fields—where the owners had obeyed the law without question—to strike also, and by the 22nd it was announced that the men demanded an open conference to deal with all grievances, with recourse to the federal arbitration court, whereas the owners insisted on a conference behind closed doors, with recourse to the State court. The Employers' Federation, an influential body representing the mass of employers in the State, dissociated itself from the colliery proprietors and proposed mediation. On 3 December a compulsory conciliation board was appointed under the State act, and the next day Peter Bowling (the chief strike-leader) was arrested on a charge of conspiracy. Within the next week several more arrests were made, and a stormy meeting of wharf-labourers demanded a general strike, but was dissuaded by W. M. Hughes (q.v.), under whose guidance the strike congress endorsed a 'policy of moderation and mediation,' and steps were taken to get the southern and western miners back to work. At this moment the State government rushed through parliament an act giving it drastic powers of repression, and the strike congress abandoned all further action, leaving the men to settle their own affairs. The western and

southern miners soon returned to work, the compulsory board decided all questions at issue, and on 11 March 1910 the northern miners returned to work also.

A dislocation lasting nine months and involving a loss of 115,000 working-days began at the Lithgow ironworks colliery in July 1911; the manager refused to re-employ a miner who had absented himself from work on union business, and all the employees at the ironworks became involved in the strike. On 4 August the government appointed a special board to consider the dispute, but no settlement was effected until April 1912, when a scale of wages was agreed upon, the delegate reinstated, and the non-unionists employed during the strike were found work outside Lithgow.

In January 1912 Brisbane became the centre of a general strike. This was called by a combined unions' committee in the hope of forcing the Brisbane Tramway Company to permit its employees to wear their union badges—presumably with the view of inducing all tramway employees to join the Australian Tramway Employees' Union. The company's manager had prohibited the wearing of these badges, and, when on an appointed day they disobeyed his order, they were told to report themselves to head office. As neither side would give way, the men sought the support of the unions, and 43 unions agreed to participate in a general strike, permits being issued to certain individuals for the transaction of necessary business and the delivery of food-stuffs. For six days the members of the Amalgamated Workers' Association (country unionists) were also called out, but they were then allowed to resume work. An attempt to secure an extension of the strike to New South Wales was unsuccessful, but the Sydney union authorities agreed to help with money contributions. Meanwhile the Queensland government had sworn in nearly 2000 special constables, and appealed to the Commonwealth government for military assistance; this, however, was refused. After a few days of general dislocation employers were able to make use of non-union labour, enough men offering for the tramways to permit of the formation of a rival union, registered under the Queensland peace act; further, the Commonwealth court of conciliation and arbitration took cognizance of the original dispute, the tramwaymen in South Australia having also been refused permission to wear their union badge. The president's ruling allowed the men to wear the badge if they so desired. The Brisbane company, having asserted its right of discriminating against members of the Australian Tramways Employees' Union, the court granted the union preference in employment the first time a preference clause was ever included in a federal award. It was, however, subsequently quashed by the high court.

Since 1909 the coal industry in New South Wales had been continually restless, and in May 1914 a strike occurred at six of the largest collieries on the northern New South Wales field because the miners refused to work the afternoon shift in ordinary places. After several unsuccessful conferences the Colliery Employees' Federation was prosecuted for aiding the strike, and heavy fines were imposed on the federation and on some of its officials. In March 1915 an agreement was reached on the basis of extra payment for men on the afternoon shift, a fixed period being allowed for the abolition of the shift. The number of working-days lost owing to this dislocation was officially estimated at 523,000, the estimated loss of wages being £259,000. In November 1915 the coal industry in all the States became involved in a serious dispute over a claim for an 'eight-hours bank-to-bank' system of working. Negotiations had been carried on in New South Wales for some time; when these failed, the collieries in that State were thrown idle, and soon afterwards those in Victoria, Queensland, and Tasmania. The effect on the community (which was then at war) was immediate and serious, production in other industries being necessarily curtailed, vessels tied up, and transport services interfered with. The Commonwealth ministry took action under the war precautions act to commandeer all coal-supplies in order to meet the requirements of the transports and warships. On 16 November a compulsory conference met under the chairmanship of W. M. Hughes (q.v.), then prime minister, who proposed that the men should return to work immediately under pre-strike conditions and that as soon as work was resumed the hearing of the dispute should be begun in Sydney before the Commonwealth court of arbitration. This proposal was rejected by the men, and another unsuccessful conference was held on 24 November. Hughes thereupon decided to appoint under the war precautions act a special tribunal with extensive powers; it met on 29 November, and on the following day the chairman announced that the men would return to work at once on the eight-hours bank-to-bank principle; further consideration was to be given to other matters in dispute, and to any pecuniary loss in which the change involved the owners. On 8 December the tribunal decided on the adoption of eight-hours bank-to-bank from Monday to Friday, and six-hours bank-to-bank on Saturday, Sunday, and holidays; an increase in rates of pay was also agreed upon. To recoup themselves for any financial loss under the new arrangement the owners were permitted to increase the price of coal under certain conditions and to a fixed amount. During this strike, owing to the general industrial dislocation, from 25,000 to 30,000 workpeople were idle in New South Wales for periods varying from one week to a fortnight, and approximately 20,000 in Victoria.

A still more serious war-time upheaval occurred in August 1917. The original dispute concerned the objection of some employees of the New South Wales railways to work under a newly introduced 'card system,' which it was feared might lead to 'speeding-up;' the men had no check on the cards, which were not open to inspection, and considered that errors in the time-records might operate prejudicially against them. On 27 July the Amalgamated Society of Engineers definitely refused to work under the system; thereafter the strike spread rapidly, railway employees in other branches of the service, coal and metalliferous miners, seamen, waterside workers, etc., declaring sympathetic strikes, while other unions not directly involved refused to handle 'black' goods. This strike occasioned 79 other disputes throughout the Commonwealth, involving nearly 100,000 workpeople, who lost 3,982,250 working-days and wages to the extent of £2,233,000. Meanwhile the New South Wales government offered that, if the railwaymen returned to work under the new system, a public inquiry would be held at the end of three months to ascertain whether the card-system was working unfairly or being used for speeding-up. The union defence committee rejected this pro-

posal, and the government made arrangements to carry on the transport services with non-unionists. Notice was given to owners of motor and horse vehicles to hold them in readiness for public service, and emergency legislation was passed on 18 August giving the government control over coal, electricity, and gas. The Victorian government also recruited non-union labour, and arranged to take over two collieries in New South Wales to meet Victorian requirements. Meanwhile the Commonwealth government had taken steps under the war precautions act to control coal-supplies, and regulations were issued to safeguard shearing operations, the transport of wool, and the loading, coaling, or discharge of shipping. Power was also taken to de-register any organization registered under the arbitration acts, and to cancel preference clauses in awards. It was soon evident that the strike would be a failure. On 6 September, after conferences between the industrial commissioner and the unions, it was agreed to accept the New South Wales government's terms on the understanding that men should be allowed daily to inspect and initial their cards, that a full list of grievances should be submitted to a special commissioner, and that the 'loyalists' who had taken the place of strikers should be retained in employment. The strike ended on 19 September. Most of the railwaymen were re-employed, but lost their seniority, which was not restored until 1926—and then only on condition that any 'loyalists' whose status was lowered in consequence of the necessary regrading should not suffer any loss of wages. In connection with this dispute an application was made to the Commonwealth court to de-register the Waterside Workers' Federation; the trouble, however, came to an end and the president refused the application, but preference clauses in a number of awards were cancelled. Several unions were de-registered under the New South Wales arbitration act, and some rival unions were formed.

The strikes of 1919 were, if measured by loss of time and wages, the most serious experienced by the Commonwealth since 1913, when official records were first compiled. At Broken Hill there had been considerable unrest since April, when the carpenters went on strike against arbitration delays; this was followed in May by a dispute between unions (in which the management became involved) as to which organization the engine-drivers should join; at the same time claims for increased rates of pay, reduction of hours, and improved working conditions were made on the companies, which refused them. A general stoppage followed, men employed in fire-protection, lighting, and pumping duties, being allowed to remain at work. More than 7000 workers were involved. Work was not resumed until November 1920, and the estimated loss of wages in connection with the dispute exceeded £2,500,000. Among disputes in the shipping industry during 1919, the most serious affected the seamen and the marine engineers. The seamen's strike, which began at Queensland ports in February, originated in the refusal of some companies to grant demands —made partly in consequence of the influenza epidemic—for increased rates of pay, insurance in case of death, better accommodation, and reduced hours of work. Seamen in the other States were not involved until May, when a general demand for increased rates of pay was made on the coastal companies and the government-owned Commonwealth line. All work at the wharves, except in connection with oversea trade, was suspended; this affected the transport of coal, and soon led to a more widespread dislocation. Victorian industries suffered seriously, and northern Queensland and Western Australia were left short of necessaries usually obtained from Sydney or Melbourne. In Melbourne relief depots were opened for the assistance of those involuntarily thrown idle, especially for women in the clothing trades. Regulations made under the war precautions act for the control and distribution of coal were reissued by the Commonwealth government. Efforts to settle the dispute by compulsory conferences were not successful. During the trouble the general secretary of the union was charged with contravening the Commonwealth arbitration act, arrested, and fined £100; at a later date he was re-arrested, fined £200, and sentenced to three months' imprisonment. During the last week in August the men agreed to man the ships and to meet the owners in conference, it being understood that any arrangement made in conference should be filed as an agreement under the provisions of the Commonwealth arbitration act. This strike terminated in favour of the men; the increase of 35s. per month was granted, the day's work fixed at eight hours, accommodation provided according to the Commonwealth navigation act, and better conditions allowed in respect of holidays, payment during illness, etc. During December 1919 the marine engineers on inter-State lines demanded higher rates of pay, and gave notice that they would leave their vessels at home ports unless their demand was conceded. It was refused, and the tying-up of inter-State vessels began. Seamen, stewards, cooks, and wharf-labourers were thrown out of employment. The regulations under the war precautions act for the control of coal-supplies were reissued, but the dislocation was much less serious than during the previous dispute. On 10 February 1920 the minister for defence took action against the institute of marine engineers, forbade any person, organization, or association to assist the strike in any way, and prohibited banks from paying or advancing any money to the institute or its members. This order was revoked on 26 September, an agreement having been reached by which the engineers were granted increased rates of pay, and provision was made for the appointment of a tribunal with an independent chairman to consider their demands.

In 1920 there was a strike of civil servants in Western Australia. There was also a chronic state of unrest on the coal-fields in New South Wales, and a special federal tribunal was appointed to deal with the miners' grievances. In Victoria thousands of factory workers were affected by a strike of factory engine-drivers for increased pay, and by a simultaneous strike of gas-workers, also on a wage-question. Employees in the building trades in all the eastern States were involved in a dispute for the 44-hour week. In the shipping industry there was a strike of marine stewards for a reduction from 15 to 13½ hours in the 'spread' of time in which their daily hours of work must be performed. Inter-State shipping was held up from 15 December 1920 to 25 January 1921, which interfered seriously with the tourist traffic to and from Tasmania. On 25 January the stewards decided to resume work unconditionally. On the following day a new dispute arose, the shipping companies requiring a guarantee from the seamen that 'job control' should cease. A number of isolated stoppages towards the close of 1920 had arisen out

of demands for the employment of more men, but the men's claims had usually been granted. When, however, the marine stewards' strike ended, owners declined to recommission their ships until the seamen promised to seek future concessions by constitutional means only, not by 'job control.' The men requested the Commonwealth government to appoint a compulsory tribunal under the industrial peace act, but this was opposed by the owners and refused by the government. A compulsory conference under the conciliation and arbitration act, called on 18 February, failed to reach a settlement. In the end an agreement was made that the question of manning would not be raised in connection with ships that were to be put into commission at the earliest possible moment; for other ships it was to be decided by a manning committee, to be constituted by 7 March at the latest. A conference on wages and working conditions was also to be held.

Among other dislocations during 1921 was a fortnight's strike of employees on the government railways in Western Australia. Temporary stoppages continued to be a feature of the coal-mining industry, and there were disputes in the building trades. The long suspension of work at Mount Morgan (Queensland) and Wallaroo (South Australia), caused by the drop in the price of copper, was not officially regarded as a lockout. During 1922 there were no serious disputes in Australia, threatened trouble in the shearing industry retaining a local character. In 1923 15 mines on the northern coal-field of New South Wales were idle for 88 days, the miners objecting to a police magistrate whose official manner was condemned as harsh; the men finally resumed work on antecedent conditions. Much more serious from the point of view of the community was a strike in the Victorian police force in November 1923; this, however, was officially regarded as a mutiny and not as an industrial dispute, and no official statistics were compiled in connection with it. The men objected to a new system of supervision, which they considered espionage (see POLICE).

In 1924 another dispute arose on the Sydney water-front. To secure the abolition of an 'overseas shipping bureau' which had been formed during the 1917 strike, the Waterside Workers' Federation decided to prohibit the working of overtime on all vessels after 5 p.m. All vessels loaded through the bureau (which was practically a rival union) were declared 'black.' There was no actual stoppage of work, but the shipping industry suffered, and a conference was called by the Commonwealth government, at which the owners agreed to abolish the bureau as from 28 February 1925. The federation's prohibition was therefore withdrawn on 15 December 1924. This agreement, however, did not bring peace to the shipping industry. Early in 1925 several vessels were held up by the Federated Seamen's Union

INDUSTRIAL DISPUTES IN AUSTRALIA 1914-24

Year.	Number of disputes.	Work-people involved.	Working-days lost.	Estimated loss in wages.
				£
1914	337	71,049	1,090,395	551,228
1915	358	81,292	583,225	299,633
1916	508	170,683	1,678,930	967,664
1917	444	173,970	4,599,658	2,594,808
1918	298	56,439	580,853	372,334
1919	460	157,591	6,308,226	3,951,936
1920	554	155,566	1,872,065	1,223,716
1921	624	165,101	956,617	757,028
1922	445	116,332	858,685	751,507
1923	274	76,321	1,145,977	1,275,506
1924	504	152,446	918,646	917,699
1925	515	180,163	1,121,285	1,102,265

on the 'job-control' issue, and on 5 June the union's registration as an industrial organization under the Commonwealth act was cancelled on the application of the shipowners. The union did not oppose the application, but determined to have a clause inserted in future articles securing the rates and conditions in force before de-registration. Towards the end of June the Commonwealth government brought in an immigration amendment bill which empowered it 'during a state of serious industrial disturbance' to call upon foreign-born trade-union leaders believed to be concerned in a dispute to show cause why they should not be deported. On 13 June the union began to withdraw its men from the service of all shipping companies—except the government line, with which a satisfactory agreement had been made; the marine transport group of unions intervened, and secured a compromise whereby shipowners granted union demands on condition that the sailors abstained from 'job-control' for two years. This abstention was guaranteed by the marine transport group, and disputes committees were set up at Australian ports. The strike ended on 7 August. A fortnight later (on 21 August) most of the British seamen in Australian ports left their ships in protest against a reduction of £1 per month in their wages, which had been agreed upon between the British Seamen's Union and British shipowners. Though this had nothing to do with Australian unionists, officials of the Australian Seamen's Union took a prominent part in it, and the strikers were supported by local funds. On 24 August the Commonwealth government proclaimed the existence of a serious industrial disturbance (under the provisions of the immigration act, 1925), and called upon two union officials to show cause before a deportation board why they should not be deported. On the recommendation of the board they were held for deportation, but were released by order of the high court. The strike, meanwhile, terminated on 30 November, the British seamen accepting the owners' terms.

See Coghlan's *Labour and Industry in Australia*; Sutcliffe's *A History of Trade Unionism in Australia*; Spence's *Australia's Awakening*; Reports and Bulletins issued by the labour department of the Commonwealth bureau of census and statistics since 1913; and *Industrial Gazette of New South Wales* from 1913 to date.

Stringy-bark. See EUCALYPTUS and TIMBERS.

Striped Opossums, marsupials belonging to the same family (Phalangeridae) as the other Australian opossums, and closely related to the flying opossums (q.v.), though without any trace of a flying membrane on the flanks. All the species are conspicuous, their bodies being prominently striped with black and white; the fourth digit is also decidedly longer than the others. There are two genera. In *Dactylopsila* the fourth digit is rather longer than the others; one species (*D. picata*) occurs in northern Queensland from Cape York to the Atherton district, and six have been described from New

Striped Opossum
(*Dactylopsila trivirgata*).

Guinea. The other genus (*Dactylonax*) has the fourth digit enormously longer than the others and very slender, its claw being much smaller than those of the other digits; the single species (*palpator*) is confined to New Guinea. According to Oldfield Thomas this animal has become specialized analogously to the lemur-like aye-aye (*Daubentonia*) of Madagascar; a single lengthened and slender digit is used in the search for grubs in wood, and powerful rodent-like incisors are useful for gnawing out the grubs. The ends of the upper incisors in *Dactylonax* are worn off abruptly by friction, not with the lower incisors (which touch them in quite a different part), but with outside objects, such as tree-trunks or boughs. The Queensland Striped Opossum (*Dactylopsila picata*) makes nests in the pandanus palms near Cairns and is reported to feed upon grubs, large moths, and other insects, using the elongated fourth digit to extract grubs and caterpillars from their retreats in the wood and bark. Berries and leaves are also eaten by these opossums, which are somewhat rare and not often observed; by the aborigines of the Atherton district they are called 'tamin.' *D. trivirgata*—which is white with three brownish-black stripes, the central one extending to the end of the tail—ranges from Waigeu Island in the north-west of Dutch New Guinea as far south as central Queensland. See MARSUPIALS and OPOSSUMS.

E.Le G.T.

Stripey. See TRUMPETER.

Strong, HERBERT AUGUSTUS (1841-1918), born in 1841 at St. Mary's Clyst near Exeter and educated at Blackheath, Winchester, and Corpus Christi College, Oxford (B.A., 1863; LL.D., Glasgow, 1885), was assistant professor of the humanities at the university of Glasgow in 1866-72, and in 1872 was appointed to the chair of classics at the university of Melbourne. In 1884 he became professor of Latin at the university of Liverpool, but resigned in 1909 and was made emeritus professor. Among his many works are translations of Virgil and Catullus (1871), a translation of Juvenal (with Dr. Leeper as collaborator), the Clarendon Press edition of Juvenal, and a *History of Language* in collaboration with Professors Logeman and Wheeler. For services to the French government he was made Officier de l'Instruction Publique. He died at Liverpool on 13 January 1918—his son SIR ARCHIBALD THOMAS STRONG, born at Melbourne in 1876 and educated at Sedbergh school and Magdalen College, Oxford (B.A., 1898; M.A., Liverpool, 1904; Litt.D., Melbourne, 1923), studied law at the Middle Temple; in 1906 he returned to Australia and in 1913 was appointed lecturer in English at the university of Melbourne. In 1916-19, during the absence of Professor Wallace on active service, Strong was acting professor of the English language and literature at Melbourne. In 1919-21 he was chief censor of cinematograph films for the Commonwealth. In 1922 he was appointed to the chair of modern literature at the university of Adelaide. His best-known works are *Peradventure*, a volume of critical essays (1911), and a translation of de Banville's *Ballads* (1913). (Kt. Bach., 1925.)

Strzelecki, SIR PAUL EDMUND DE (1796-1873), perhaps better known as Count de Strzelecki in the nobility of Poland, was born in Polish Prussia in 1796 and educated at Heidelberg and Edinburgh. While still young he travelled extensively; he says that in 12 years (apparently between 1830 and 1842) he visited 'North and South America, part of the West Indies, the South Sea Islands, New Zealand, New South Wales, Van Diemen's Land, the Javanese Islands, part of China and the East Indies, and Egypt.' About 1838 he reached Sydney, and devoted himself to an exhaustive study of the main range and its foothills, during which he discovered traces of gold both in pyrites near Hartley and in quartz near Wellington; Gipps, however, who took great interest in his work, warned him that an announcement of such a discovery in New South Wales would make it almost impossible to maintain discipline among the 45,000 convicts then in Australia. He therefore scrupulously omitted mention of his find from his *Physical Description of New South Wales and Van Diemen's Land* (London, 1845). In 1839, while exploring southern areas of the range where it doubles round the Monaro tableland towards the Murray, Strzelecki discovered the Muniong or Snowy

Range west of Cooma, and named its highest point (as he thought) Mount Kosciusko, after the Polish patriot. (It has since been ascertained that another hummock not far away is slightly higher, and the name has been transferred to this, the one first named being now known as Mount Townshend.) Following the Snowy River to a blackfellows' track which took him to the Tambo, and obtaining information there from Angus McMillan (q.v.), who had pioneered this route and gone a little farther west, Strzelecki traversed the district (which he named Gippsland) with extreme difficulty, finding himself on Western Port when he had intended to strike Port Albert. For these labours he received the Royal Geographical Society's gold medal. Returning to Sydney, he next spent two years in similar researches in Tasmania, but in 1843 returned to England, published his book, was in 1847-8 a commissioner for the Irish famine relief fund, and in 1855 an active member of the Crimean army fund committee. His later years brought him many honours, including a fellowship of the Royal Society in 1853 and the D.C.L. degree of Oxford in 1860. He died in London on 6 October 1873. His name is attached to a range near Western Port which he discovered, to a peak on Three Hummock Island in Bass Strait, and to a creek connecting Lake Blanche with Cooper's Creek in the NE. of South Australia. He was the original of Count Smorltork who graced Mrs. Leo Hunter's breakfast party in *Pickwick*. (C.B., 1848; K.C.M.G., 1869.) See EXPLORATION BY LAND.

Stuart, SIR ALEXANDER (1825-1886), born in Edinburgh in 1825 and educated at Edinburgh Academy and the university of Edinburgh, pursued a commercial career in Leith and Glasgow, and eventually became manager of the North of Ireland Linen Mills. In 1845 he migrated to India, and a year or two later moved to New Zealand; in 1851 he reached New South Wales, spent a year on the goldfields, and in 1852 was made assistant-secretary to the Bank of New South Wales, becoming in 1854 secretary and inspector of colonial branches. In 1855 he left the bank to join the firm of Towns and Company (see TOWNS, ROBERT). On 9 September 1874 he was returned by East Sydney to the legislative assembly as a supporter of denominational education, and in 1876-7 was colonial treasurer in the Robertson ministry. In 1879 he resigned his seat on being appointed agent-general for New South Wales, but did not take up the post, and in 1880 returned to the assembly as member for the Illawarra, becoming leader of the opposition. In 1882 he defeated the Parkes-Robertson ministry on their land bill, and took office in January 1883 as premier and colonial secretary (from 29 March to 29 May he was also secretary for public works). His own land act, passed in October 1884, was the product of a select committee and of the longest and almost the severest session of a New South Wales legislature. He also initiated measures for the regulation of the public service and the introduction of federation. In October 1885 ill-health compelled him to resign office; he was appointed to the legislative council, but at the end of the year went to London as executive commissioner for the colony at the Colonial and Indian Exhibition. He died in London on 16 June 1886. (K.C.M.G., 1886.) J.V.C.-B.

Stuart, JOHN MCDOUALL (1815-1866), born at Dysart in Fifeshire, Scotland, on 7 September 1815, and educated in Edinburgh, in 1838 migrated to South Australia and temporarily joined the government survey staff, practising later as a surveyor and for a time devoting his energies to sheep-farming. On 12 August 1844 he joined Sturt's expedition to central Australia as a draughtsman. In 1858-62 he made journeys into the interior (all described under EXPLORATION BY LAND), and won the bonus of £2000 (and 1000 acres rent-free for seven years) offered by the South Australian government to the first man who crossed the continent. In 1863 he sailed for England and settled in London, where he died on 5 June 1866. His journals are in the Mitchell Library at Sydney. J.V.C.-B.

Stuart, SIR THOMAS PETER ANDERSON (1856-1920), son of Alexander Stuart of Dumfries in Scotland, was born on 20 June 1856, educated locally and at the university of Edinburgh, and after winning nine medals and the Ettles scholarship within seven years graduated in 1880 (M.B., Edin.; M.R.C.S., Lon.; M.D., Edin., 1882). A year of study at Strasburg, and a year spent as demonstrator to Professor Rutherford at Edinburgh, helped to qualify him for the post to which in 1882 he was appointed without opposition—the chair of anatomy and physiology at the university of Sydney. His work there, continuously from March 1883 to the end of his life, consisted mainly in two achievements, the foundation and expansion of the medical school and the re-organization and expansion of the Royal Prince Alfred Hospital (see HOSPITALS). The medical school began with four students in a four-roomed cottage; at his death it mustered 857 students and occupied a well-designed building which had cost altogether something like £130,000. The hospital (which served as a clinic for the medical school) did not come under his direct influence until 1901, when it had 236 beds in occupation; at his death it had 518 beds, the older buildings had been completely remodelled, and two new blocks (providing for nearly 250 beds) and a nurses' home added, while its activities in the direction of pathological research, X-ray work, orthopaedics, and social service had been greatly extended. Quite apart, however, from the university and the hospital Stuart's public work was manifold. In 1890 he was commissioned by the colonial government to investigate the Koch cure for consumption (which he reported to be no cure, but an aid to diagnosis), an appointment which resulted in his becoming medical adviser to the government and chief health officer for the colony (1892-6) and in his establishing government laboratories which have been of inestimable value. He was twice president of the Royal Society of New South Wales, served on innumerable committees for public objects, and took an active part in originating or forwarding such diverse movements as the institute of tropical medicine, the British immigration league, the British Association's expeditions to Funafuti (see DAVID, SIR T. W. E.), and a local society for combating venereal diseases. Amid such occupations, mainly of an administrative character, he found comparatively little time for scientific research or for writing, but investigations concerning the structure of the eye, a kymoscope for elucidating the phenomena of circulation, and an artificial larynx, are recorded to his credit. He died 'in harness' on 29 February 1920. (Kt. Bach., 1914.) J.W.

Stump-jumping Plough, THE. In the early 1870s large areas of rough, partly

timbered land in Victoria and South Australia were thrown open for settlement, but could not be cultivated owing to the expense of clearing and grubbing the land. Several inventors appear to have worked at the problem almost simultaneously, but the first to come before the public was Robert Bowyer Smith of Ardrossan on Yorke Peninsula in South Australia—now one of the richest wheat-growing areas in the State. He and his brother Clarence Herbert Smith in 1876 constructed a plough with shares which worked independently of each other in a frame; on any one of the shares striking a stump or other obstruction, it automatically rose, passed over the obstacle, and re-entered the ground. This principle had already been used in horse-hoes and seed-drills. On 19 February 1877 this plough (named 'the Vixen') was registered, but the Smiths did not then patent it. In 1881 J. W. Stott, a blacksmith of Alma in South Australia who had constructed a similar plough, joined the Smiths and made improvements in their machine; in the new model several ploughs were hinged to an angle-bar so that each had the same length of beam, and the beams were cranked to allow each mould-board to pass the adjoining beam. The South Australian Royal Agricultural Society now took up the matter and persuaded the legislature to vote R. B. Smith a grant of £500; other claimants then appeared, among them R. H. Shapland, who declared that he had invented a stump-jumping plough in 1875. When in 1882 Smith, Stott, and some Adelaide business men patented the new model, Shapland received £150 in satisfaction of all claims. Without the stump-jumping plough the mallee lands of Victoria and South Australia might never have been scientifically cultivated for wheat. R.T.F.

Sturt, CHARLES (1795-1869), son of a judge in the East India Company's service, was born at Chunar near Benares in India on 28 April 1795 and educated at Harrow. On 9 September 1813 he joined the army as ensign in his uncle's (the 39th) regiment (lieutenant, 1823; captain, 1825). Army lists show him as stationed with the 2nd battalion at Plymouth until June 1814, but according to his own account he joined the 1st battalion in Spain in February of that year and saw fighting in the Pyrenean passes and at Toulouse. Later in the year he served in Canada, and in 1815-18 with the army of occupation in northern France; in 1819-26 he was with the regiment in Ireland, and reached Sydney with it in May 1827. Almost immediately he was appointed to Governor Darling's staff as aide-de-camp and acting military secretary. Darling was impressed with his scientific knowledge, and in November 1828 despatched him—with Hamilton Hume as second in command—to discover the course of the Macquarie beyond Oxley's terminus of 1818; this and Sturt's other expeditions are described fully under EXPLORATION BY LAND. In November 1829 he was sent to trace the course of another river, the Murrumbidgee; the hardships he endured on this expedition, accumulating on the ill-health that had resulted from the first, made him for some time incapable of rendering a considered report of his doings, and as late as April 1831 Darling had to send to the colonial office merely the rough notes Sturt had made during the journey. In doing so Darling strongly recommended him for military promotion, and the colonial office passed the recommendation on to the war office, but no action was taken on it until late in 1831, when it was too late. Meanwhile Sturt had been sent in 1830 to Norfolk Island—where he stifled an incipient insurrection of convicts—and in June 1831 Darling proposed to make him government resident in New Zealand, but abandoned the proposal when he learnt that he himself was to be recalled. At the colonial office the appointment of a civilian resident was favoured, and Bourke was asked to send Sturt on a third expedition along the lower Darling; but Norfolk Island had not improved his health, he was blind in one eye and temporarily blind in the other, and in March 1832 went back to England on sick-leave. On 19 July 1833 he resigned his commission, partly because of his blindness, partly because a pension of £100 a year which was offered him by the British government could not be paid so long as he was receiving military full pay. In July 1834 the colonial office belatedly offered him a grant of 5000 acres in New South Wales, and he returned to the colony and settled at Mittagong.

His zeal for exploration was still strong, and in 1838 he took charge of an 'overlanding' party with cattle for South Australia and took the opportunity of travelling along the Hume from Albury to the point where he had in 1829 entered it from the Murrumbidgee and named it the Murray. In September 1838 he tried to enter the Murray mouth in a whale-boat, and his failure—which showed that no great city could be sited on Encounter Bay—put up the price of land in Adelaide by 25 per cent and more. In 1839 he took his family to Adelaide, where Governor Gawler had appointed him surveyor-general; the colonial office having meanwhile made another appointment, Sturt was made assistant commissioner of lands, and worked harmoniously with his supplanter until in August 1842 he was made registrar-general. In January 1843 desire for travel again overtook him, and he suggested to the colonial office an expedition to the centre of the continent. After long delays leave was granted, and he started on 10 August 1844. Nineteen months later he returned to Adelaide so broken in health as to make further exploring journeys impossible. He resumed his work as registrar-general, and in September 1845 added to it that of the colonial treasurer; in 1849, resigning both these posts, he became colonial secretary, and at the end of 1851 retired on a pension, returning to England in 1853 and living quietly there until his death on 16 June 1869. He published two books on his travels—*Two Expeditions into the Interior of Southern Australia* (1833), dealing with the journeys of 1828-9 and 1829-30, and *Narrative of an Expedition into Central Australia* (1849), dealing with the journey of 1844-6. In 1847 the Royal Geographical Society awarded him the founder's gold medal, and in 1869 he was nominated K.C.M.G., but died before the honour could be gazetted. J.V.C.-B.

Sturt's Desert Pea. See CLIANTHUS.

Stypandra, a genus of the family Liliaceae, consisting of herbs with fibrous roots; the three species are endemic in Australia. The flowers are blue or white, in a loose, branching spray; capsules ovoid; seeds black; leaves usually tufted. *S. glauca*, the Blind-grass or Candyup Poison of Western Australia, is said to cause blindness in stock that habitually eat it. In recent years it has come under a similar suspicion in New South Wales, but its

properties have not yet been thoroughly investigated. In this showy-flowered species the

Blind-grass or Candyup Poison (*Stypandra glauca*).

flower-stem is leafy, and the grass-like blades are arranged on the stem in regular pairs.

Styphelia, one of the two typical genera of the family Epacridaceae (q.v.), consisting of shrubs which usually have prickly-pointed

S. viridis.

leaves and showy flowers. Eleven species are indigenous to Australia. The calyx is frequently coloured; corolla-tube elongated, cylindrical, hairy inside, the lobes rolled back exposing the stamens; fruit a drupe, with a more or less pulpy outer coat and a bony 5-angled inner coat. *S. viridis* and *S. longifolia* have greenish flowers, those of *S. triflora* shading from pink to yellow. *S. tubiflora* is a low, spreading bush with small, scarcely succulent fruits, and bright ruby-coloured flowers. It was cultivated in England in 1802, and appears among the ornamental shrubs in certain nurserymen's catalogues. See FIVE-CORNERS.

Success, THE. The notorious so-called 'convict-ship' *Success,* a vessel of 622 tons burthen, was in 1840 built of Indian teak at Moulmein in Burma to ply in the first-class passenger trade between Britain and the East Indies. In 1849, and again in 1851, she carried emigrants to Australia, and on the second occasion was deserted by her crew, who, like so many other crews in that year, went off to the diggings. In 1852 the Victorian government found its gaol accommodation insufficient for the many criminals whom the gold-rush had attracted to the colony; it therefore built 'stockades' at Carlton, Richmond, and Pentridge, and bought five old ships to be converted into prison hulks for the worst criminals. Among these was the *Success,* which was formally constituted a hulk on 27 June 1853, and for the next four years harboured desperadoes, many of them ex-convicts from Tasmania, but all sentenced anew for crimes committed in Victoria; to that extent and no further the vessel might be called a 'convict-ship.' On 26 March 1857 John Price (q.v.), then head of the penal department, was murdered at Williamstown by a gang from the hulks, and his successor, William Champ, decided to do away with them. The *Success* was accordingly disused on 1 January 1858 and in July abandoned—her four fellow-hulks were sold to be broken up, and it is not known why she did not share their fate—one account attributes it to 'a clerical omission in the terms of sale.' In 1860-68 she was, according to the same account, used as a women's prison, and in 1869 as a dormitory for boys from the reformatory ship *Sir Harry Smith;* later she became a storeship for explosives. In 1884 she was bought by speculators, who fitted her up to represent a convict-ship, and in 1890 engaged Harry Power the ex-bushranger (see BUSHRANGING) to act as showman. She was exhibited at Melbourne and Sydney, and was being refitted at Kerosene Bay in Port Jackson for a voyage to London when in 1892 she sank at her moorings—it is said that she was deliberately scuttled. When raised six months later, the customs authorities refused her a clearance for either London or the United States, but she was surreptitiously taken to London and shown in the Thames for several years. In 1912, having lost her power to attract, she was removed to New York and shown there and in other American ports, still as a genuine convict-transport with a full equipment of leg-irons, cats-o'-nine-tails, etc. In 1917, having again ceased to 'draw,' her owners proposed to equip her with Diesel engines and use her for riverine trade, but she was wrecked on an ice-flow in the Ohio River and rendered useless for anything but exhibition. At long intervals she is still mentioned in the Sunday editions of U.S.A. newspapers.

This vessel must not be confused with H.M.S. *Success,* the warship in which Captain James Stirling (q.v.) investigated Raffles Bay and the Swan River.

Sucker-fishes, members of the family Echeneididae which have a large laminated plate covering the top of the head and providing a highly efficient sucking-disk; it enables the fish to attach itself to the hull of a ship, or to the body of a shark or whale, and so to be carried about without effort to itself. The disk is a modification of a dorsal fin, and is so constructed that, though the fish can detach itself at will by swimming forward, yet the skin and flesh will sometimes tear before it can be pulled off backwards. Natives of various parts of the Indian and Pacific oceans utilize these fishes in the capture of turtles. Tying a line round the tail, they liberate it in the vicinity of a turtle, to which the fish readily attaches itself. If the turtle is a small one, it can then be hauled in; if it is fairly large, the attached line serves to guide a swimmer to the captive, which is then secured with a stronger rope. Sucker-fishes are commonly confused by seamen with pilot-fishes, because of their habit of associating with sharks; but the true pilot-fish (q.v.) is allied to the trevallies.

Notwithstanding their curious habit of attaching themselves to larger fishes, sucker-fishes are good swimmers, and most of them are widely distributed. Three have been recorded from Australian waters, one of which is very common in both temperate and tropical seas. A.R.McC.

Sucking-lice, vernacular name of insects of the order Anoplura, long believed to be a sub-order of the Hemiptera, but best treated as a separate order allied to the Mallophaga (biting-lice), with which they agree in having nothing in their lives that can be called a metamorphosis. They are distinguished from the Mallophaga by (*a*) their mouth, which has a sucking beak formed from the hypopharynx, (*b*) their thorax, which is fused into a single whole, and (*c*) their tarsus, which ends in a single claw. The Anoplura are parasitic on mammals only.

The only true Australian species known so far is *Hoplopleura bidentata,* taken from the native water-rat (*Hydromys chrysogaster*) found at Lake Torrens in South Australia, and belonging to the family Haematopinidae, whose members infest rodents and ungulates. Nine other species of this family have been introduced, including *Haematopinus suis* (from the pig), *H. asini* (from the horse), *Haemodipsus ventricosus* (from the rabbit), *Linognathus ovillus* (from the sheep), and *L. piliferus* (from the dog). There are also four introduced species of the family Pediculidae, which infest man and the monkey; these are the three well-known parasites of man—*Pediculus capitis, P. vestimenti,* and *Phthirus pubis*—and a single species discovered on monkeys in the zoological gardens at Sydney and Melbourne. *P. vestimenti* is the carrier of the spirochaet of relapsing fever, and of the viruses of typhoid and trench fever.

See Johnston and Harrison's 'Note on Australian Pediculids' in the *Proceedings* of the Royal Society of Queensland (1912), and Ferns's 'Catalogue of the Anoplura' in the *Proceedings* of the Californian Academy of Science (1916). R.J.T.

Sudan Campaign, The. News of General Gordon's death at Khartoum on 26 January 1885 was received in Sydney about noon on 11 February. On the 12 the *Sydney Morning Herald* published a letter from Sir Edward Strickland in which he suggested that Australia should follow the Canadian example and offer military assistance to Great Britain. A special cabinet meeting, called by W. B. Dalley, q.v. (who was acting-premier during the absence in New Zealand of Alexander Stuart), decided the same day to offer 500 infantry and two batteries of field artillery with 10 16-pounder guns, to be landed at Suakin on the Red Sea within 30 days of embarkation. The offer was well received in London, and on the 15th the British government accepted the infantry and one battery on condition that the contingent should be under the commanding officer in the Sudan. Volunteers were enlisted for a force of one 6-gun battery with 212 men, 522 infantry, and 200 horses; two troopships, the *Australasian* and *Iberia,* were made ready, and a 'patriotic fund' to provide for casualties was opened. Victoria, South Australia, and Queensland also offered assistance, but the British government preferred to avoid further delay and refused them. This put an end to suggestions for the despatch of an Australian contingent. The New South Wales contingent, under the command of Colonel J. S. Richardson, embarked on 3 March and reached Suakin on the 29th.

The legislature, which had not been consulted concerning the offer, was called together on 17 March to grant the government an indemnity for its actions, which were admittedly unconstitutional—for the government was not empowered to enlist soldiers for overseas service. George Dibbs (q.v.), the government's spokesman in the assembly, claimed that an imperial act of 1881, which provided for the employment of colonial troops abroad, applied in this instance, but it was held by the opposition that the act contemplated only forces already raised legally for service at home. Moreover a great deal of money had been spent without parliamentary sanction. Henry Parkes (q.v.), who was not in parliament at the time, stirred up opposition in the press, and towards the end of March won an election in Argyle as a protest against the government's action. There is no doubt, however, that the government had popular support, and the indemnity act was passed with only two dissentients.

The contingent, when it reached Suakin, had hardly any fighting. As a mark of courtesy it was brigaded with the guards, and took part in an unimportant skirmish at Tamai, during which three of its members were slightly wounded. For the most part it was put to railway fatigue-work near Handoub and Otao, but 50 men were detached to form part of a camel corps. When it was decided to bring the campaign to an end, the New South Wales government suggested that the contingent, if it volunteered for further service, might be employed in India or at a Mediterranean station; it was decided, however, to repatriate the men, and on 17 May they were embarked in the troopship *Arab.* Eleven cases of fever were left in hospital at Suakin and Suez, and 12 at Colombo; there were six deaths in all. On 23 June the contingent disembarked at Sydney and was disbanded.

Sudds and Thompson. See Darling, Sir Ralph.

Sugar. In Australia cane-sugar is produced only in Queensland and New South Wales, nearly 93 per cent of the cane being grown in Queensland. In 1882 an unsuccessful attempt was made to start the industry in the Northern Territory.

In 1823 Thomas Scott made 70 tons of sugar at Port Macquarie in New South Wales, but not until 1847 was interest in the matter reawakened and cane grown in the Brisbane valley and the Moreton Bay district. The first to manufacture sugar from Queensland-grown cane was M. Buhot, who obtained his cane from the Brisbane botanic gardens. The establishment of the industry on a commercial basis was the work of Louis Hope, who in 1862-3 had 20 acres under cane in the Moreton Bay district, in 1864 introduced kanakas for work in the cane-fields (Towns had used them in 1863 for cotton cultivation), and in 1867 was voted thanks and a grant of land by the Queensland parliament 'for his successful demonstration of the suitability of the Queensland climate to the growth of sugar-cane.' As land became obtainable more cheaply and more easily, interest in the industry grew, and the Queensland Acclimatization Society began to import new varieties of cane; in 1864 sugar companies were formed in Brisbane, Maryborough, and Mackay, where cane was first planted by John Spiller and the first mill erected by J. Ewan Davidson. By the end of 1869 28 mills were crushing the produce of 1230 acres, 5000 acres in all being under cane.

In New South Wales, when cane-growing was at last taken seriously, the Port Macquarie district was found unsuitable because of the danger of frosts, and cultivation began farther north along the Clarence, Richmond, and Tweed rivers. In 1865 about 141 acres were under cane; by 1875 the area had increased to 6454 acres, and 50 mills were crushing. The maximum area was reached in 1895, when 33,000 acres were under cane and more than 100 mills were at work; since then the industry in New South Wales has declined—22,000 acres in 1890, 14,000 in 1910, 10,500 in 1919—cane-growing having been replaced in these districts by dairying and maize-growing. From 1919 onwards cane-growing came again into favour, and in 1925 19,993 acres were under cane (all these figures are exclusive of cane grown as a fodder-crop).

In Queensland the industry experienced many vicissitudes. After 1869 there was a steady development for several years. About 1876 the cane-fields were almost completely destroyed by rust, to which the thick, succulent, slow-growing varieties then favoured were particularly subject. A harder type, maturing in one season, escaped, and the planters uprooted all diseased cane and planted the immune variety. At this time the output of sugar was 15,000 tons, and the failure of the crops produced financial panic and much hardship. McCready of Mackay, however, demonstrated for five consecutive seasons that sugar could be produced at a cost of not over £10 per ton, and the industry recovered so completely that in 1878-9 there was a 'boom' in cane-farming. In 1883-4 157 mills were crushing cane from 27,792 acres (out of a total of 43,367 acres under cane), and producing 34,148 tons of sugar and 144,073 gallons of rum. But just then a second serious setback occurred, due partly to two successive dry seasons, partly to coloured labour troubles (for which see IMMIGRATION RESTRICTION), and intensified by a fall in the price of sugar. The objection to black labour, and especially to the system of recruiting in the islands commonly known as 'blackbirding,' grew steadily, and with the adoption of the 'White Australia' policy (q.v.) by the Commonwealth government the introduction of kanakas finally ceased. An act of 1904 prohibited their importation, and provided for the deportation within two years of those already in Australia. In 1906 6000 Polynesians were deported. In 1902 68 per cent of Queensland sugar was produced by black labour, in 1914 only 4 per cent.

The Commonwealth has assisted the industry by means of bounties and excise tariffs, with the double object of benefiting the industry and diminishing the employment of coloured labour. At first a rebate (£2 per ton maximum) was given on sugar manufactured exclusively by white labour. In 1912 a sugar bounty abolition act and a sugar excise repeal act were passed by the federal parliament, to come into force when the Queensland parliament should prohibit the employment of coloured labour. In 1915 the Commonwealth assumed control of the Australian sugar output, paying the growers a fixed price—£18 per ton of raw sugar, subsequently raised to £21; the government disposed of the refined product at £25 10s. per ton, the retail price being fixed at 3d. per lb. In 1920 an agreement covering 1920-21-22 fixed the price of raw sugar at a minimum of £30 6s. 8d. per ton, the wholesale price of refined sugar being raised to £49 per ton, and the retail price to 6d. per lb. On the termination of the 1922 season the agreement was not renewed, but the embargo against the importation of sugar grown by black labour was continued for two years, on condition that a pool, free from government control, was formed to buy raw sugar for the coming season at not more than £27 per ton. In 1923 the retail price of refined sugar was reduced to 4½d. per lb.

For the 1924-5 season the price of raw sugar was not to exceed £27 per ton. The embargo against black-grown sugar was prolonged until June 1925, and was then extended by agreement with the Queensland government for three years from September 1925.

Sugar-growing districts.—In Queensland sugar-cane is cultivated in the belt extending from 16° to 28° S.; the bulk of the cane is grown in the tropics. The tropical districts, going from south to north are:—Mackay, Burdekin River, Herbert River, Johnstone River, Cairns, Port Douglas, and Bloomfield River; the principal subtropical districts are:—Moreton Bay, Nerang River, Coomera River, Logan and Albert rivers, Pine River, Mary River, and Burnett River.

The following table shows the progress of the industry since federation:—

Years.	Queensland		New South Wales	
	Cane (acres)	Sugar (tons)	Cane (acres)	Sugar (tons)
1900-01 ..	108,535	92,554	22,114	19,938
1910-11 ..	141,779	210,756	13,763	20,115
1916-17 ..	167,221	176,973	10,969	16,064
1923-24 ..	219,965	269,175	17,315	16,829
1924-25 ..	253,519	407,454	19,993	26,032

The area under crop in 1924-5 was the largest on record, but not the whole of it was cut for crushing. The figures in the above table give the total area.

The yield of sugar varies with the season, soil, and methods employed. The average yield per acre for 1914-24 was:— Cane per acre crushed—17.28 tons: sugar per acre crushed—2.1 tons: cane to each ton of sugar—8.23 tons.

BEET-SUGAR.—In 1869 the Tasmanian government offered a bonus of £2000 to any person or company for the production of 200 tons of beet sugar in one year; this bonus has never been

claimed. Spasmodic attempts have also been made in New South Wales, at Bathurst and Tenterfield, but the farmers have declined to bind themselves to grow the amount required to justify the building of a sugar-mill. The beet-sugar industry is at present entirely confined to Victoria, where in 1872 a company was formed to establish a sugar-beet industry at Geelong; but the company collapsed, and for 20 years no revival was attempted. In 1896 the government granted £100,000 to assist a new company, and substantial buildings and plant were erected at Maffra in Gippsland. Local landowners guaranteed to sow 1500 acres of beet. Two campaigns produced respectively 617 and 348 tons of sugar, after which the buildings and plant fell into the hands of the government and lay idle for 12 years. In 1910 energetic measures were taken to revive the industry; experimental plots were grown, lectures instituted, and large areas at Boisdale and Kilmany Park, in railway communication with Maffra, were divided into small holdings and bounties offered to growers. Since then there has been continual progress, and the last records, with the increased price of sugar, showed a profit of £8000. Irrigation would assure the future of an industry, which, it is stated by one leading grower, is more profitable than dairying or pig-raising, while requiring less capital for its initiation. The following figures show the area under sugar-beet in Victoria and the returns:—

Years.	Acres under crop.	Beet produced.	Average per acre.
		tons.	tons.
1910-11	458 ..	5,969 ..	13.03
1912-13	934 ..	6,207 ..	6.65
1914-15	990 ..	10,343 ..	10.45
1916-17	1320 ..	15,159 ..	11.48
1923-24	1937 ..	29,512 ..	15.24
1924-25	1897 ..	24,468 ..	12.90

The sugar produced in 1924-5 amounted to 3017 tons, and the season was in every respect a profitable one. Growers were paid in 1923-4 37s. 6d. per ton for their beet, and the beet-sugar factories realized a profit of £19,016.

F.B.G.

Sullivan, THOMAS BARRY (1824-1891), born in Birmingham on 5 July 1824 and educated at Bristol, at 14 years of age entered an attorney's office, but, diverted to the stage, in 1837 was an actor of minor Shakespearian parts. He soon rose to eminence in this type of drama, worked his way through Ireland, Scotland, and the English provinces to London by 1852 and New York by 1858. In 1862-6 he starred in Australia, devoting most of his time to Shakespearian revivals, which were made especially interesting by the simultaneous appearance of Charles Kean at a rival theatre (often in the same part). From 1863 to 1866 he managed the Theatre Royal at Melbourne, and netted a small fortune, mainly by his policy of securing good players to support him; Kean, a better actor, with a poorer company could not endanger Sullivan's popularity. A vigorous and declamatory actor, he suited the provinces and colonies better than London, though he repeatedly challenged its verdict, and often with success. He died at Brighton on 3 May 1891.

Summers, CHARLES (1825-1878), son of a stonemason, was born at Charlton Mackrell in Somerset on 27 July 1825, and worked with his father while a boy, but, when he had saved enough, moved to London, obtained work as a journeyman sculptor, and studied in his spare time at the Royal Academy under Henry Weekes and Lewthwaite Watson; in 1850 he won the academy's silver medal and in 1851 the gold medal. In 1853 he migrated to Victoria and went to the diggings, but soon tired of them and opened a studio in Melbourne. There he carved the figures on the ceiling of the legislative council-chamber (since used by the Commonwealth senate), the frieze of the Bank of New South Wales in Collins-street, and the spandrel figures at the entrance to the Bank of Victoria. He also designed and cast the heroic group of Burke and Wills which stands in Spring-street near the federal parliament-house—the first work cast in bronze in Australia. In the Melbourne gallery he is represented by 17 examples. He modelled busts of Charles Sturt, G. V. Brooke, Bishop Perry, and other notable persons. Returning to England in 1866, he settled in Rome and exhibited regularly in London. To this period belongs his beautiful recumbent figure of Lady Macleay—wife of Sturt's companion George Macleay—in the church at Godstone in Surrey. In 1878 he determined to revisit Australia, but on his way out died in Paris on 30 November of that year. See ART.

W.M.

Sunbird, a brilliantly coloured bird (*Cyrtostomus frenatus*) about four inches long, the sole Australian representative of the family Nectariniidae. Sunbirds are found throughout Africa and tropical Asia, and in habits and the

Sun-bird (*length* 4½ *in.*).

brilliancy of their plumage vie with the humming-birds of America, to which they present a superficial resemblance, though there is no special connection between the families. The single species found in Australia occurs only in northern Queensland, extending thence through the Papuan islands and Moluccas to Celebes.

The male is yellowish-green above, with a metallic blue patch on the throat, and a bright yellow breast; in the female both throat and breast are yellow. Like other members of the family, this species feeds on insects and honey, extracting the latter from flowers with its long curved bill. The nest is hung from the under-surface of a branch, or very often from the edge of a verandah or window-frame. It is composed of vegetable hairs from the stems of palms, lined with vegetable down and soft bark fibre, with an entrance at the side. The eggs are greenish-gray, mottled with brown.

W.B.A.

Sundew, the popular name of the genus *Drosera*, belonging to the family Droseraceae, which comprises herbs, found in nearly all parts of the world, with a special reputation as insect-catchers. Three genera of the family, with 53 species (of which 50 belong to *Drosera*) are indigenous to Australia, most of them to Western Australia. They are usually found in marshes. The leaves, which in the bud are curled up, and unfold like the fronds of a fern, are usually covered on the upper side with sticky hairs (the longest projecting from the leaf-margin) that are extremely sensitive and close over insects or other objects resting upon them. From the glands on the tips of these hairs exudes a viscid fluid, which acts like the gastric juice of animal life and dissolves the fleshy parts of the captured insects; the juice is then absorbed by

Forked Sundew (*Drosera binata*).

the plant. *D. binata* (Forked Sundew) is a fern-like herb with long narrow leaves, the blade segmented into two or more symmetrically-forked branches, and comparatively large flowers. It ranges from South Australia into Queensland, and extends to New Zealand. This plant was used by Darwin in his experiments on insectivorous plants. It often has as a messmate an insect in the form of a small assassin bug (Reduviidae), which camps on the back of the leaf and shares the captured prey. A. G. Hamilton has found a similar insect on *Byblis gigantea*. *D. spathulata* represents a stemless group, with basal rosetted leaves folded as in a penwiper. It has pretty (white to pink) flowers, and ranges from South Australia to Queensland, extending also to Tasmania and New Zealand. *D. arcturi* is found at high elevations on the Australian Alps and the higher mountain peaks in Tasmania. From the bulbous root-stock of *D. Whittakeri*, a species ranging from South Australia into Victoria, two beautiful red colouring substances have been ex-

Byblis gigantea.

tracted. *Byblis* has two species limited to Australia, insectivorous plants with showy blue flowers. *B. gigantea*, a stout herb with a hard root-stock and relatively large flowers, is limited to Western Australia. *Aldrovandia* has one indigenous representative, *A. vesiculosa*, a floating insectivorous herb found in Queensland, and extending to Asia.

Sunfishes, pelagic fishes (Molidae) of extraordinary form, the head and body being compressed and more or less circular, with high dorsal and anal fins projecting almost vertically. The peduncle which in all other fishes supports the tail-fin is obliterated in the sunfish, and the tail is little more than a fringe along the hinder margin of the body. Having lost this, the principal organ of propulsion in most fishes, sunfishes have to swim with their dorsal and anal fins. They are related to the porcupine-fishes and toadoes, which they resemble in various ways, particularly in having the teeth united to form a beak-like structure. They are oceanic fishes, range over all warm and temperate seas, and are sometimes observed in calm weather swimming lazily near the surface, with their high dorsal fins projecting out of the water. Two species, belonging to different genera, are known from Australian waters. The common species, *Mola mola*, is evidently not rare off Australian coasts, and is occasionally stranded on ocean beaches. A large example, which became entangled in a ship's propeller off the coast of New South South Wales, was over 10 feet long and 6 feet deep.

The young are even more grotesque in form

than the adults, being armed with large up-standing spines, and provided with a body so reduced that the fish appears to be nearly all head.

A.R.McC.

Superb Warbler, See WRENS.

Supplejack. See VENTILAGO.

Surveying. See GEODESY.

Sutherland, ALEXANDER (1852-1902), born in Scotland in 1852 and brought by his parents to Australia in 1864, was in 1867 a pupil-teacher under the New South Wales department of education and in 1871 matriculated at the university of Melbourne (B.A., 1874; M.A., 1876). In 1877 he bought a school at Carlton (a suburb of Melbourne) which he subsequently moved to Parkville and conducted until 1892. He contributed voluminously to British and local magazines and wrote several school-books which had a wide circulation; but his chief work—to complete which he retired from teaching in 1892—was *The Origin and Growth of the Moral Instinct* (London, 1898). He stood for parliament twice, but failed on both occasions—in 1897 for the colonial legislature, in 1901 for the federal parliament. After the second failure he became registrar of the university of Melbourne, and for a time acted as professor of English literature, but broke down under the double task and died on 9 August 1902. For eight years he was secretary to the Royal Society of Victoria. He was a facile and sometimes a brilliant writer, unfortunately dependent for his historical and biographical information on sources which since his death have been proved untrustworthy. His book on the moral instinct, however, no less an authority than Francis Galton called 'thorough and comprehensive,' and it it was much praised in the more important French, German, and Italian philosophical journals. His influence on the culture of Melbourne, both as educator and writer, was considerable.

Sutherland, WILLIAM (1859-1911), brother of Alexander (q.v.), was born in Dumbarton, Scotland, on 4 August 1859, and brought by his parents to Australia in 1864. He was educated in Melbourne, first at the Model School, then at Wesley College. In February 1876 Sutherland matriculated (B.A., 1879; M.A., 1883); in 1879 he gained a Gilchrist scholarship which took him to England to study at University College, London (B.A., 1881, with the Clothworkers' scholarship). Though a scientific career was assured in London, he preferred to rejoin his family in Melbourne, and was back there in February 1882. From this time the tenor of his life was remarkably even. He was an applicant for chairs at the universities of Adelaide, Melbourne, and Sydney, and took his rejections with admirable spirit. Offers of appointments at a distance from his home, or on the staff of a newspaper, were unhesitatingly rejected. By a little coaching and examining, and by writing a weekly leader and an occasional special article for the *Age* newspaper, he earned a small income which he deemed adequate; he was content if by a third of a day's work he could earn a living and devote the remaining portion to studies dear to him. These were almost entirely in the domain of molecular physics, and some 69 papers (most of which appeared in the *Philosophical Magazine*) attest his extraordinary mental energy and productiveness.

It is difficult to assess the value of his contributions to knowledge; as Sir J. J. Thompson has said, though he was 'a remarkable man' in research, he shone better as philosopher than as expositor. His first accepted scientific success (1893) was the solving of the problem of the relation between the viscosity of a gas and its temperature. It had baffled Clerk Maxwell, but Sutherland explained it dynamically, and his formula and constant are found now in textbooks of physics. His analysis of the 'ducks and drakes' phenomenon displayed by smooth stones on water, published in a paper entitled *High Tensions in Moving Liquids*, is also an accepted commonplace in such textbooks, as are the names of his devising, 'hydrol' and 'trihydrol,' and his views as to the composition of steam and ice. The theory that the earth's magnetism is due to the carrying round of an electrostatic field in its rotation was first put forward by him in 1900, and his calculations have been confirmed by Baur. In 1901 appeared one of his most daring speculations—which has attracted a good deal of attention from physicists—the attempt to establish a causal relationship between the rigidity of an element and its spectrum. In 1902 he published his electric doublet theory, and subsequent years were devoted to its application and the endeavour to prove that the properties of matter are electric in origin. This great and recondite investigation seemed to excite little interest in the scientific world until Sir J. J. Thompson in 1914 drew attention to its deep significance. There are now indications that several of his hypotheses are beginning to bear fruit, e.g. his theory of the radiometer and his views on ionization in solutions. He died at Melbourne from heart-failure on 5 October 1911.

Another brother, GEORGE SUTHERLAND (1855-1905), was educated at the Sydney Grammar School, at Scotch College, Melbourne, and at the university of Melbourne (B.A., 1877; M.A., 1879), commenced teacher in 1878, but abandoned that profession for journalism; he wrote a few books, and invented devices (*a*) for reproducing photographs in daily newspapers, (*b*) for concentrating metals from low-grade ores.

See W. A. Osborne's *William Sutherland* (Melbourne, 1920), an appendix to which gives a complete list of Sutherland's contributions to scientific literature.

W.A.O.

Suttor, GEORGE (1774-1859), born at Chelsea on 11 June 1774 and trained in horticulture by his father, in 1798 met Joseph Banks and conceived a wish to settle in New South Wales. Banks placed him and his wife aboard the *Porpoise* (first of that name) early in the year to take charge of a consignment of plants and fruit-trees; but the vessel after a series of misfortunes got only as far as Madeira, returned to England in September 1799, and was condemned. Her crew, passengers, cargo, and equipment were transferred to a Spanish prize—re-christened *Porpoise*—which left England on 17 March 1800 and reached Port Jackson on 6 November. By Governor King's advice he went to Parramatta, and as soon as possible took up a grant of 200 acres at Baulkham Hills, which he named 'Chelsea Farm;' the government built him a cottage and assigned him convict labourers, and he set to work to grow oranges and grapes. In 1804 he wrote despondingly to Banks, having suffered greatly during the Castle Hill convict mutiny, but by 1807 was supplying Sydney plentifully with oranges. In 1808 he sided with Bligh, and

was severely punished by the successful mutineers; his assigned men were taken from him, he was tried for writing a contumelious letter, and was imprisoned for six months in the Old George-street gaol. When Macquarie arrived, Suttor was sent to England as a witness on Bligh's behalf and sailed with him in the *Hindostan* on 12 May 1810. During his absence the farm was carried on by his wife, under the patronage of Maurice O'Connell (who had married Bligh's daughter), and when he returned in 1812 he found his affairs in excellent trim. In 1814 Macquarie made him superintendent of the Castle Hill lunatic asylum in succession to Samuel Marsden; tiring of this work—for he was essentially a farmer—he applied towards the end of Macquarie's term for leave to take up land across the Blue Mountains, but did not gain permission till Brisbane arrived. In February 1822 he took 400 sheep and a few cattle to Bathurst and settled on a 320-acre grant at Brucedale on the Winburndale Creek. His affairs now prospered greatly; he leased grazing land, his flocks multiplied, and he was able to build a fine house in Sydney, where Allan Cunningham lived with him and Leichhardt was a frequent visitor. In 1839 he visited Europe, was made on Robert Brown's nomination a fellow of the Linnean Society, and published a small book on the culture of the grape-vine in Australia. Returning to New South Wales in 1845, he bought Alloway Bank in 1851 from the heirs of John Piper and lived there till his death on 5 May 1859.

George Suttor was the founder of a notable Australian family. His third son, WILLIAM HENRY SUTTOR (1805-1877), was born at Chelsea Farm on 12 December 1805, took active charge of his father's Brucedale land while still a lad, and speedily extended its area to some 10,000 acres, while his flocks ranged half-way to Mudgee. He was from the first on excellent terms with the aborigines, who gave much trouble to less tactful settlers. When in 1843 the first elective legislature was established, W. H. Suttor was returned without opposition for the counties of Roxburgh, Phillip, and Wellington, and held that seat (with a slight change of name) until 1854. Although not an active debater, his influence was considerable and well used. He strongly advocated the cessation of transportation, believing from long experience that free labour was far more effective than assigned labour. Retiring temporarily in 1854, he was in 1856 elected to the new assembly for Bathurst county, and sat for that constituency, for the neighbouring East Macquarie, and for Bathurst city continuously (except for two short periods when he tired of politics and resigned) until 1872. But his chief achievements lay outside politics. He was an ardent and successful pioneer squatter, establishing sheep and cattle stations on the western rivers of New South Wales, and at one time ran cattle on the Logan River in Queensland. He befriended Leichhardt, who named the Suttor River after him. He died at Alloway Bank on 20 October 1877.

Two of his sons also attained political distinction. WILLIAM HENRY SUTTOR (1834-1905), the eldest, born at Brucedale on 14 November 1834 and educated at Parramattta under William Woolls (q.v.), was given in 1857 charge of his father's stations on the Lachlan, and on several occasions took cattle overland to Melbourne; Ben Hall's gang of bushrangers visited him once or twice, but did little harm. Moving in 1875 to an estate adjoining Alloway Bank, he represented East Macquarie in the assembly from 1875 to 1880, and was then nominated to the council. He was secretary for mines in the Farnell ministry of 1877-8, vice-president of the council in the Parkes ministry of 1889-91, and for a short time held the same position in the Reid ministry of 1894; but, his health failing, he retired into private life in 1895, and died in 1905. He was a representative of New South Wales in the federal convention of 1891. His *Australian Stories Retold*, published at Bathurst in 1887, is useful for students of the early pastoral times.

Another son, FRANCIS BATHURST SUTTOR (1839-1915), born at Brucedale on 30 April 1839 and educated at The King's School, Parramatta, settled in 1863 at Katella station near Wellington. In 1873 he moved to Bathurst, established himself at Bradwardine, just across the river from the main Suttor holdings, and soon made a name as a breeder of sheep and horses. In 1875 he was sent to the assembly from Bathurst, which constituency he represented unterruptedly until 1887, and again in 1891-4 and 1898-1900. In 1889-91 and after 1900 he sat in the legislative council. Usually taking in politics the side opposite to that of his brother, he was minister of justice in the short-lived Parkes ministry of 1877, administered the departments of justice, public instruction, mines, and the post-office, at different times during the Parkes ministry of 1878-83, was postmaster-general in the Jennings ministry of 1886-7, minister of public instruction in the Dibbs ministries of 1889 and 1891-4, and vice-president of the council in the Lyne (1900-1) and See (1901-3) ministries. On 2 June 1903 he was made president of the council, and held that position until his death on 4 April 1915.

His really important work was connected with pastoral life; he was for many years president of the Royal Agricultural Society, the New South Wales Sheep-breeders' Association, and the Stock-owners' Association, and in all did active and useful work. He was in his later years also a trustee of the art gallery and a senator of the university of Sydney. (Kt. Bach., 1903.)

Another son of George Suttor, JOHN BLIGH SUTTOR (1809-1886), represented East Macquarie in the assembly from 1867 to 1872, and from 1881 to 1886 sat in the council. He died on 27 May 1886.

H.M.S.

Swainsona. See DARLING PEA.

Swallows and Martins, small, broad-billed birds, living on insects which they capture during flight, are members of the family Hirundinidae, which is represented throughout the world. The Welcome Swallow (*Hirundo neoxena*), a near relative to the well-known English swallow, is the commonest member of the family in Australia. In Tasmania it is a summer migrant from the mainland, but throughout the greater part of the continent is a resident. Its mud nest, lined with feathers, is in uninhabited districts placed in caves or crevices of rocks; in the settled regions it is almost always found on a beam or shelf of a verandah, bridge, jetty or some other artificial structure. Two other members of the genus are visitors to the northern coasts.

The Tree Martin (*Petrochelidon nigricans*) and Fairy Martin (*P. ariel*) differ from swallows not only in coloration but in having the tail square instead of forked. The former nests in holes in trees, the latter constructs a remarkable bottle-shaped nest of mud. Each species usually nests in colonies; groups of fairy martin nests may frequently be seen plastered on the sides of cliffs, buildings, or bridges.

The Black-and-White Swallow (*Cheramoeca leucosternum*) is chiefly confined to the inland areas; it digs a long narrow burrow in a bank or in the side of a wombat-hole or well, and places its nest in a chamber at the end.

Black-and-white Swallow. (*length* 5½ *in.*).

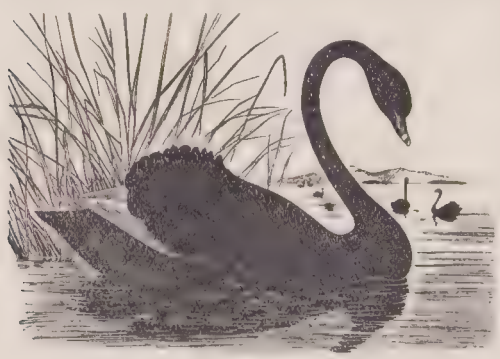
The wood-swallows are members of a distinct family, and are treated in a separate article.

W.B.A.

Swallow-shrike. See WOOD-SWALLOWS.

Swallow-tail. See DARTS and NANNYGAI.

Swan, Black, the only Australian representative (*Chenopis atrata*) of the swans (Cygninae) of the family Anatidae, is found throughout Australia and Tasmania in suitable localities. Black Swans were discovered on 6 January 1697 by members of the Dutch expedition under



Black Swan (*length* 40 *in.*).

Willem de Vlamingh, on the Western Australian river, the Swan, which thus received its name. Four were captured, two of which were taken alive to Batavia and presented to the governor-general of the Dutch Indies. The discovery aroused special interest, since the whiteness of swans was proverbial in Europe and the expression 'black swan' had until then been regarded as a contradiction in terms. When a British settlement was founded on the Swan River in 1829, the black swan was taken as the emblem of the colony and later was figured on its postage-stamps. It is still the emblem of the State of Western Australia, with the punning motto 'Cygnis insignis.'

In the early days explorers of the coast-line were much advantaged by the abundance of black swans on all coastal lakes and estuaries, especially as when moulting they are for a time unable to fly, and can then be captured without great difficulty. Bass and Flinders subsisted largely on swans while exploring Bass Strait and circumnavigating Tasmania in their small boat, in which it was impossible to carry sufficient provisions for the journey. Murray, while exploring Port Phillip in 1802, had one of his boats constantly engaged in the pursuit of swans to obtain fresh food for the crew; his log contains numerous references to the numbers captured, e.g. on 22 February he notes: 'The boat proceeded a mile and a half, and in running that, caught 20 swans of a large size without wasting one charge of shot, which by-the-bye is now become a scarce article.' The inlet where this occurred, close to the present town of Queenscliffe, was called by him Swan Pond, and the islands separating it from Port Phillip the Swan Islands. Black swans still frequent the locality in numbers.

Swans are undoubtedly the most elegant of waterfowl. W. H. Hudson, writing of the black-necked swan of Argentina, says: 'It will be readily admitted by all, I think, that the black-necked bird is one of three species greatly surpassing all others of this genus in beauty—the other two being, of course, the domesticated Swan of Europe and the Australian Black Swan (the most graceful of Swans).' The bird's plumage, black for the most part, is relieved by the red bill and the snow-white colour of the wing-quills. These latter, which are almost concealed when the bird is feeding on the water, are very conspicuous when it takes to flight, and the sudden flashing of white wings when a big flock of swans rises from the water is a sight not easily forgotten. When flying, the neck is stretched straight out in front, and the birds utter a high-pitched mellow honk, which is frequently heard at night from a flock travelling high overhead from one sheet of water to another. The food consists of water-plants, which are pulled up from the bottom by aid of the long neck in shallow water. The nest is a bulky structure of sticks or reeds, usually built on a mound or tussock in a swamp; from four to six eggs of a greenish colour are laid, and the two birds take turns in incubating them. The cygnets are covered with light gray down.

W.B.A.

Swan River Blaze Tree. See NUYTSIA.

Swan River Daisy. See BRACHYCOME.

Sweetbrier. See NOXIOUS PLANTS.

Sweet-lips, a name applied to several tropical fishes of the genus *Plectorhynchus,* remarkable for their greatly thickened lips. Some are highly ornate, with diverse patterns and bright colours; but, though they attain to a large size, few of them are valued as food-fishes. See JAVELIN-FISH.

A.R.McC.

Swifts. birds with very long, pointed wings, small feet, and wide, short beaks, belonging to the family Cypselidae, members of which occur all over the world. Only two species occur in southern Australia, both summer visitors, which breed in the northern hemisphere during the Australian winter. The larger species, the Spine-tailed Swift (*Hirundapus caudacutus*), is one of the most powerful fliers known, wheeling and sweeping through the air at a very high speed in pursuit of flying insects. In northern Queensland a small kind of swift called the Gray-

rumped Swiftlet (*Collocalia francica*) breeds in colonies in caves, constructing basket-like nests of fine grass and fibre, which are cemented together and attached to the walls of the cave by the bird's saliva. This species is nearly related to the swift (*C. esculenta*) that produces the

Spine-tailed Swift (*length* 7½ *in.*).

edible birds' nests—made entirely of hardened saliva—which are regarded as delicacies in China. W.B.A.

Swimming in Australia dates from the earliest days of the settlement. Up to about 1900 surfing was not a popular pastime, but as the population round the beaches and seaside resorts grew, the pastime came into favour, and has now taken a permanent place among summer sports. On all much-frequented beaches patrols of first-class and specially trained swimmers are maintained by the many surf-clubs to assist those who may find themselves in difficulties with the under-tow.

For speed-swimming Australia has become famous. Race-swimming first began in Victoria in 1867, when F. Kitz won many contests and claimed the title of champion. In 1875 J. McIndoe was considered a wonderful swimmer; he defeated all comers, swam 100 yards in 1 min. 11¼ sec., and won many match and handicap races over distances of from 100 yards to one mile. In 1880 the Port Jackson Swimming Club was formed, and held races regularly at baths in the Sydney Domain. The Enterprise and Balmain clubs were the next, and in 1892 the New South Wales Amateur Swimming Association came into existence. Most of its racing was held at the Natatorium, on the site of the present People's Palace in Pitt-street, Sydney; W. J. Gormley, C. Hellings, J. Hellings, and G. A. Meadham were prominent swimmers of the early nineties. In 1894 the first Australian championship matches were held in New Zealand, under an arrangement between the New Zealand and New South Wales associations, which were the only ones then existing in Australasia. A strong team of swimmers was sent to New Zealand, and Thomas Meadham won the 100 yards, W. J. Gormley the 220, 440, and 880 yards, and J. Tooher the plunge.

By 1900 associations had been formed in the other Australian colonies, and championship contests were held in each. In 1909 the Australian Swimming Union was formed, with representatives from all the associations, and became the governing body for Australia. In every State there exists a branch of the Royal Life Saving Society, which holds instruction classes in life-saving; to swimmers who pass certain tests a certificate or medal is given. The surf life-saving clubs, Royal Life Saving Society, and swimming associations work together. Further, in every State the department of education has swimming taught, wherever practicable, to school-children of both sexes. In 1911 Victoria appointed Frank Beaurepaire its chief instructor, and under his guidance an excellent system of teaching was inaugurated; in New South Wales Harold Hardwick was appointed in 1920.

Up to 1895 the stroke used by champion swimmers was the side-stroke or 'single overarm.' The features of this stroke are the leg movements, in which the action resembles the opening and shutting of a pair of scissors—hence the name 'scissors kick.' Lying on one side, the swimmer pushes the arm under him forward to its full length under water, at the same time opening his legs for the kick; just as the arm begins to pull back, the kick is made by a sharp movement from the knee, bringing the legs together; at the same time the arm above is carried forward to make its pull while the under arm is recovering and the legs are gaining position for the next kick. Gormley, a champion of this period, finished his kick with legs crossed, thereby obtaining propulsion both when making the kick and when recovering for the next kick.

The first Australian to win a race abroad was Percy Cavill, who in 1897 won the 440-yards and long-distance championships of England. In 1899 F. C. V. Lane won the English 220-yards championship in 2 min. 38⅘ sec., defeated England's best swimmers, and established several records. During the same period J. H. Hellings won several important races in England. During 1900 games after the style of the Olympic games were held in Paris, and F. Lane, by winning the 200-metre race, earned the title of world's champion. In 1902—a great year for Australia—a team comprising Lane, George Read, and R. Cavill visited England and almost daily established times hitherto thought impossible. Lane was the first man to cover 100 yards in 60 seconds (then thought to be the limit of speed attainment), but Cavill soon afterwards swam the distance in 58 3-5 seconds. Lane then won the 220-yards championship in 2 min. 28⅘ sec. In the English championships interest centred on the contests between the Australians—Lane won the 100-yards and 220-yards, Cavill the 440-yards and 880-yards, besides many other races. Cavill during this trip established figures unparalleled in the history of the sport for distances from 100 yards to one mile.

Returning to Australia, Cavill continued his successes, winning all State championships and establishing records at all distances. In 1901, however, George Read won the mile championship in 24 min. 46⅘ sec. About the same time Alec Wickham, a South Sea islander, began to show wonderful speed, produced by a new 'crawl' stroke in use in the islands. Lane had used a 'double overarm' or trudgeon-stroke, in which both arms are carried out of the water in recovery; Cavill used a trudgeon-stroke like Lane's, but requiring less exertion. After Wickham appeared, Cavill adopted for sprinting a crawl-stroke like Wickham's. This stroke was swum by keeping flat on the chest, extending the arm in front of the head, and pulling straight back; the kick was made by kicking from the knee straight up and down and keeping the legs together—the right leg kicked just as the left arm was beginning to pull, and the left leg when the right arm was beginning to pull. Cavill

usually swam for several strokes without breathing, and was consequently unable to use the crawl-stroke for distances of above 100 yards. In 1904, while Cavill was still the champion, B. B. Keiran—a boy in the New South Wales training-ship *Sobraon*—was improving quickly under the tuition of the old champion R. R. Craig. He met Cavill in the Coogee aquarium bath at 440 yards, and after a desperate race Cavill just won. On 12 March 1904 the pair again met, this time at 880 yards, and Cavill was defeated after a game struggle. Keiran followed up this success with a wonderful series of performances in 1905. After his Australian successes he was sent to England under the management of Hilton Mitchell. In his first race—the mile championship of England, held at Highgate Ponds—Keiran met the English champion, David Billington, who defeated him after a great struggle, possibly because he had been only ten days ashore and was therefore not yet fit for a hard race. Keiran afterwards met the best swimmers in Europe (including Billington), and defeated them all easily. On his return to Australia he went to Brisbane for the Australian championships, won the 220-yards in the Australian record time of 2 min. 28⅘ sec., and was then taken very ill; a few days later he was operated on for appendicitis, gradually weakened, and died. His records of 5 min. 19 sec. for 440 yards, and 11 min. 11⅘ sec. for 880 yards, were until the coming of Andrew Charlton recognized as the greatest of swimming performances.

About the same time Cecil Healey, of the East Sydney Club, came into prominence as a sprinter, and lowered Cavill's 100-yard record from 58 sec. to 57 sec. In 1906 Healy was sent to the Olympian meeting at Athens and was placed third to the American C. M. Daniels and the Hungarian Z. de Halmay.

In 1907 Victoria produced in the person of Frank Beaurepaire its first champion swimmer for nearly 20 years. At 17 years of age, after a little coaching from George Farmer in Sydney, he won at Perth all the free-style events from 440 yards to one mile, and proved himself a fine stayer. In 1908 he won all the championships except the 100-yards, which went to Healy.

The Olympic games of 1908 were held in London. Beaurepaire, who represented Australia, was placed second in the 400-metre and third in the 1500-metre event. In 1910 he again visited Europe, competed against the best swimmers of several nations, and won every race in which he competed—48 in all—the distances being from 100 yards to three miles.

Meanwhile New South Wales enthusiasts busied themselves in finding new representatives to take the place of Keiran and Cavill. Healy, who had been looked upon as a sprinter, in 1910 developed a crawl-stroke for distance racing; Harold Hardwick was rapidly coming forward as an all-distances performer, and Albert Barry and others (including E. Wickham, the younger brother of Alec) arrived from the islands to increase competition. Beaurepaire, who returned to Australia at the end of 1910, in January 1911 came to Sydney for the Australian championships. It was believed that Healy would extend the world's champion and might possibly defeat him, and about 7000 people crowded to the Domain baths to see the race for the 1320-yards Australian championship. William Longworth, a lad of 18 who had been selected as third representative for New South Wales (Healy and Hardwick being first and second selections), went to the front from the start and soon established a lead from Healy and Beaurepaire. The crowd watched the two champions, but Longworth continued to gain, and at half-way led by 20 yards; Healy and Beaurepaire, watching one another closely, made extreme efforts to catch the leader, but Longworth won by 33 yards in 17 min. 42 sec.—a world's record for 1320 yards. In the 440-yards championship Longworth, Healy, and Beaurepaire started off at an impossible pace; Beaurepaire had to give up at 220 yards, Healy was beaten off at 250 yards, Longworth led to the last 10 yards, but was then exhausted, and Hardwick, who had swum a steady race, won the race by one yard. Longworth in Brisbane won the mile championship, but was defeated by Hardwick in the 880 yards, Beaurepaire and Healy not competing. At the end of this season Beaurepaire accepted a position as instructor to the Victorian schools, becoming thereby a professional.

During 1911 Hardwick and Finlay visited Europe. Hardwick won the 100-yards swimming and the heavy-weight boxing contests at the Empire sports, as well as many races in Europe, including the 100-yards, 220-yards, and 440-yards championships of England. Finlay, who was the Australian breast-stroke champion, was successful in the King's Cup life-saving competition—the only Australian who has won this event.

In 1912 Longworth won all the Australian and New South Wales championships at from 100 yards to one mile. In that year the Olympic games were held in Sweden; Longworth, Healy, Hardwick, and L. Boardman were sent to represent Australia, with Fanny Durack and Mina Wylie to represent the Australian women-swimmers—Fanny Durack had developed the crawl-stroke of Healy and Longworth and established women's records for all distances. At the games Fanny Durack was successful in the women's races and established an Olympic record, Mina Wylie being placed second. Among the men Longworth was unfortunate—he had to be operated on for a mastoid abscess of the ear and retired after qualifying for the finals of the 100- and 1500-metre events; Healy came second to Kahanamoku in the 100-metre race, and Hardwick was third in the 400- and 1500-metre events. In the teams race Champion of New Zealand replaced Longworth, and in a close finish, amid great excitement, Australia won by 10 yards from the United States.

After the 1912 Olympic games Longworth returned to his form and dominated the championships, winning in 1913 all the New South Wales races, and all Australian championships except the 100-yards, which he lost to E. Wickham in Melbourne; in 1914 he repeated this performance, losing the 100-yards event to the improved sprinter Albert Barry. In 1915 the Hawaiian Duke Paoa Kahanamoku, the world's champion, visited Australia and defeated her sprinters at the Domain baths, recording 53⅘ seconds for 100 yards. Longworth, who had won the half-mile and easily defeated Adrian and others, fell ill and could not swim. Kahanamoku won the 220-yards race from Gordon Page, but in the 440-yards Adrian defeated him. Kahanamoku used an independent crawl-stroke, his feet beating the water just under the surface at a very fast rate independently of his arm-stroke. Many Australian swimmers copied him, but found the stroke very tiring.

The war of 1914-18 put an end for the time to racing. Most of the great swimmers enlisted; Cecil Healy was killed in France, Barry lost a leg, and Adrian and many other fine swimmers came back with health impaired. At the close of the war inter-Allied games were held in Paris, at which a team consisting of Longworth, Hardwick, Solomans, Steadman, Dexter, Springfield, and Morris represented Australia. The team won the relay race from America; Longworth was second in the 400- and 800-metre events, Hardwick second in the 1500-metre, and Solomans second in the 100-yards event.

In 1920 the American Norman Ross—who had created some ill-feeling at Paris in 1919 by competing, although he had not served as a soldier in France—visited Australia and won many races. In short baths he was a phenomenal swimmer owing to his strength and agility at the turns; he was only defeated once—at St. Kilda by Beaurepaire, who was favoured by the St. Kilda conditions—rough water and rope turns. Ross afterwards defeated Beaurepaire several times by very narrow margins. Ross's stroke was the 'trudgeon-crawl,' a combination of the trudgeon and crawl strokes; he swam on his right side, with a very short trudgeon-kick (with his knee straight) just as his right arm entered the water, and kicked as the pull was being made. On the completion of the trudgeon-kick three small beats were made while the left arm was pulling, and when the right arm was in position the right leg was again placed for the trudgeon-kick. This stroke, known in the United States as the four-beat trudgeon-crawl, was new to Australia.

In 1920 a team was sent to the Olympic games at Antwerp; it comprised Beaurepaire, Herald, Hay, Kirkland, and Steadman. Herald qualified for the 100-metres, but Kahanamoku won the race. Beaurepaire was adversely affected by the cold water. The success of Ross's tour had induced the Australian Swimming Union to ask other international swimmers to visit Australia. In 1921 came Ludy Langer and Pua Kealoha, the Hawaiian champions. In Sydney the visitors carried all before them, Kealoha winning the 100-yards race and Langer the 220, 440, and 880 yards—the 880 yards he covered in 11 min. 16⅘ sec. In Melbourne Beaurepaire defeated Langer three times, and Kealoha once.

In 1919 Fanny Durack and Mina Wylie visited America, but the trip was a failure owing to bad arrangements; only a few races were held, and Charlotte Boyle of U.S.A. defeated both the Australians, who had no opportunity to attain condition. Miss Durack afterwards married and dropped out of active contests. In 1921 the Ladies' Association invited the world's champion Ethelda Bleibtrey to visit Australia. Miss Bleibtrey won all her races in Queensland, New South Wales, and Victoria, and in Sydney established a world's record (64⅘ sec.) for 100 yards. During 1923 two New Zealand girl-swimmers visited Australia, Violet Walrond winning the 100-yards Australian championship from Gwitha Shand, with Mina Wylie of New South Wales third. The 220-yards and 440-yards events Miss Shand won in very fast times.

In 1922, during the carnivals in Sydney, Andrew Charlton, a boy 14 years old, won the 440-yards first-class race in 5 min. 45 sec., and was picked out by keen judges as a likely champion; he was therefore coached by Tommy Adrian till the following season. On Boxing Day 1922 Charlton covered 440 yards at Manly in 5 min. 16 sec.—the best time recorded in Sydney; the performance was unofficial but authentic. At the carnival Charlton covered 880 yards in 11 min. 5 sec. (a world's record)—a remarkable performance for a boy of 15. He then defeated the Hawaiian visitor W. W. Harris in the 440-yards championship, winning easily in 5 min. 22 sec. Meanwhile in Europe Arne Borg, a Swede, was carrying all before him, and was asked to visit Australia in 1924. The first meeting of Borg and Charlton took place in January at the Sydney Domain baths; Charlton won the 440-yards race by 20 yards, equalling the world's record time of 5 min. 11⅘ sec., and the 220-yards race in 2 min. 23⅘ sec., which time constitutes an Australian record. At 880 yards there was a great battle, but Charlton shook off his opponent in the last 50 yards, and won in 10 min. 51⅘ sec.

Charlton swam no more that season, but Borg in the mile championship at Sydney covered the distance in 22 min. 34 sec. Apart from his matches with Charlton, Borg suffered only one defeat, by Beaurepaire in the St. Kilda baths over 1320 yards.

Charlton's stroke has been moulded on Ross's trudgeon-crawl; he swims on his right side, makes the trudgeon-kick with his knee straight just as his right arm is pulling, and keeps his feet moving with short beats until it is time to make the trudgeon-kick again; he uses his full reach in placing his arms forward, and only when sprinting shortens his stroke and quickens his kick. Charlton is of heavy build, with a long reach and powerful shoulders and legs. Arne Borg's stroke resembles the crawl-stroke of Healy and Longworth; he kicks his right leg at the same time as he pulls with his left arm, and his left leg when he pulls his right arm. Borg does not extend his arms to their full length until after they enter the water, cuts his arms in short in front of his head, and extends under the water in the direction of his opposite shoulder; he has no trudgeon-kick, but kicks twice with his right leg and once with his left leg, using an up and down kick. Borg is tall, but not heavily built, his weight being only about 11 stone.

1924 was a very important year in swimming. In America Weismuller smashed many short and middle distance records, and Arne Borg carried everything before him in Europe. In Australia Charlton defeated him in three great contests. The Olympic games were held at Paris in July, and attracted swimmers from all parts of the world. A special bath was constructed at the Tourelles Gardens, and competitors for the first time swam in lanes, with 50-metre laps. The Australian team, comprising A. Charlton, E. Henry, F. Beaurepaire, M. Christie, I. Steadman, and R. Eve (diver), arrived in good time, and developed splendid form in training. Charlton easily won his way to the final of the 1500-metre race, in which he had Borg as his chief opponent, Weismuller not competing. At the start Borg assumed command, but at 250 metres Charlton drew level, took the lead, and, gaining at each lap, eventually won by 45 metres in the world's record time of 20 min. 6⅘ sec.; during the race he also established a new world's record for 1000 metres. Beaurepaire finished a very creditable third—a splendid performance at his age. In the 100-metre event the Australians were out-classed by the Americans, Henry alone doing well, though unable to qualify for the final. Weismuller won easily from Duke Kahanamoku, with Sam Kahanamoku third. Weis-

muller, Borg, and Charlton qualified for the 400-metre final, and their meeting was the event of the games; Weismuller won by two metres from Borg (with Charlton third, a similar distance behind) in 5 min. 4⅘ sec.—an Olympic record. In the 800-metre teams race Australia swam second to America, with Sweden third. R. Eve won the plain diving championship.

Later on they took part in the Irish Tailteann sports, where Charlton won the 200, 400, 800, and 1500 metre events, Steadman the 200-metre breast-stroke race, E. Henry the 100-metre free style and 100-metre back-stroke, R. Eve the plain and fancy diving competitions, and the team the 400-metre teams race, the Australians thus carrying off every event on the programme. It returned to Sydney on 26 September 1924.

In 1925 Charlton and Henry retired, and Sam Kahanamoku visited Australia; he outclassed our swimmers up to 220 yards, but M. Christie defeated him in the 440-yards championship of New South Wales. During this season Frank Doyle, a Sydney boy, won the 100-yards titles of New South Wales and Australia, and Maricchen Wehselan, the Hawaiian woman champion, gained many victories over Australian women.

In 1926 Frank Doyle improved greatly and retained the 100-yards championships of New South Wales and Australia, covering the distance in the Domain baths, Sydney, in 54⅘ sec., the fastest ever done by an Australian. M. Christie again proved Australia's best distance swimmer, but was hard-pressed by younger competitors—e.g. R. Grier (Queensland), E. W. Jones (Western Australia), and O. Griffiths (New South Wales). Grier defeated him at 220 yards, and swam Doyle to six inches at 100 yards.

During this season Ena Stockley and Piri Page, the New Zealand women champions, visited Australia and proved themselves much more speedy than the Australian women; but a Sydney girl, Claire Couldwell, showed great promise, and annexed the 150, 220, 300, 440, and 880 yards championships of New South Wales, and the 220 and 440 yards championships of Australia. She is the best Australian woman swimmer since Fanny Durack. W.L.

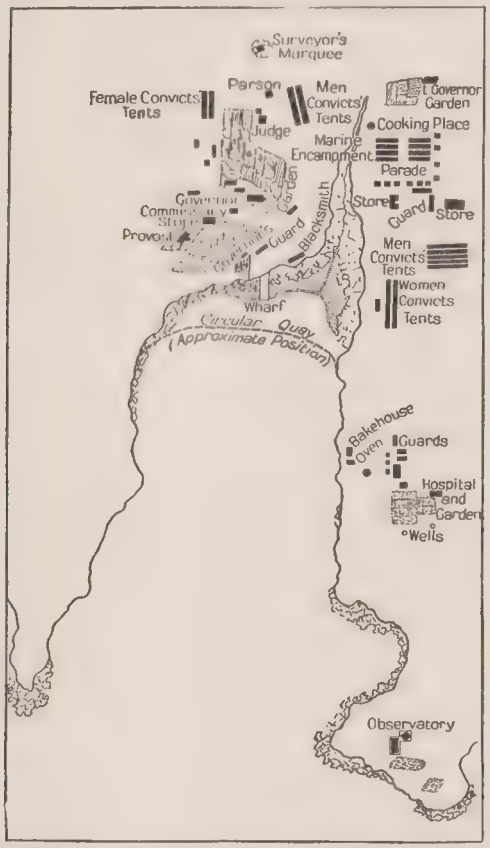
Sword-fishes. Several related but distinct families of fishes, each having a long blade-like projection of the upper jaw (rostrum), are commonly grouped under this vernacular name. A not uncommon representative in open seas off the Australian coasts is a species of *Tetrapturus*, which has its blade flattened and sword-like; in specimens 15 feet long it may be nearly three feet in length. It is widely distributed over the Indian and Pacific oceans. The Spear-fish (*Xiphias gladius*), which ranges throughout the warm seas of the world, differs from the sword-fish in having the rostrum rounded in section. Sail-fishes (*Istiophorus*), inhabitants of the tropics, also have a sword-like rostrum, but in them the dorsal fin is greatly elevated to form a sail-like structure, the rays being several feet in length and supporting a tough leathery membrane that is often ornamented with brilliant colours.

These are some of the largest bony fishes known. They are famed for their habit of attacking whales and porpoises, which they stab repeatedly with their rostral blades. They have also been known to rush blindly at ships, doubtless mistaking them for large cetaceans, and their rushes have been so powerful that timbers 10 inches thick have been penetrated. In these cases, the fishes have generally failed to withdraw their weapons, which have snapped off and remained fast in the wood. Because of their pugnacious disposition, sword-fishes are sought by some big-game-fish enthusiasts, who capture them with rod and line. They are captured in parts of the Mediterranean with harpoons. A.R.McC.

Sydenham, Lord. Sir George Sydenham Clarke, first baron Sydenham of Combe, born in Lincolnshire on 4 July 1848 and educated at Haileybury and the royal military academy at Woolwich, joined the royal engineers in 1868, and from 1871 to 1880 was on the staff of the royal Indian engineering college at Cooper's Hill. He served in the Egyptian expedition of 1882 and the Sudan expedition of 1885, was secretary to the colonial defence committee in 1885-92, and after a term of special service for the war office left the engineers with the rank of colonel and was made governor of Victoria in 1901. On his return to England in 1904 he became secretary to the committee of imperial defence (1904-7), the governor of Bombay (1907-13); he then retired from active service, and was created a baron. He was chairman of a royal commission on contagious diseases in 1913-15 and of the central appeal tribunal in 1915-16, and a member of the air board in 1916-17. He is a fellow of the Royal Society, and in 1917 was chosen to be president of the British Science Guild. (C.M.G., 1887; K.C.M.G., 1893; G.C.M.G., 1905; G.C.I.E., 1907; G.C.S.I., 1911; G.B.E., 1917.)

Sydney, the capital of New South Wales and oldest city in Australia, is situated on the shores of Port Jackson (see Harbours) in 33° 52′ S. lat. and 151° 12′ E. long. The port was sighted, but not explored, by Cook on 7 May 1770 (see Exploration by Sea) and named by him in honour of the secretary to the admiralty; it was described in the Hawkesworth account of his voyage as 'a bay or harbour in which there appeared to be a good anchorage.' When Governor Phillip decided that Botany Bay was an unsuitable place to settle at, he made a hasty examination of Port Jackson and selected a bay on its southern shore, which he named Sydney Cove in honour of Lord Sydney, the British home secretary. The first party landed here on 26 January 1788. Collins thus describes the place: 'The spot chosen for this purpose was at the head of the cove, near a run of fresh water, which stole silently through the very thick wood, the stillness of which had then for the first time since the creation, been interrupted by the rude sound of the labourer's axe, and the downfall of its ancient inhabitants;—a stillness and tranquillity which, from that day, were to give place to the voice of labour, the confusion of camps and towns and the busy hum of its new possessors.' In his first despatch to Lord Sydney Phillip said that 'the different coves were examined with all possible expedition. I fixed on the one that had the best spring of water, and in which the ships can anchor so close to the shore that at a very small expence quays may be made at which the largest ships may unload. This cove, which I honoured with the name of Sydney, is about a quarter of a mile across at the entrance, and half a mile in length.' The city of Sydney derives its name from the Cove; no proclamation naming it was ever made. Phillip heads his early despatches from 'Sydney Cove,' but after 17 June 1790 he writes from 'Sydney.' White in his *Journal*, writing in June 1788, states that the governor called the district of which he had taken posses-

sion 'Cumberland County,' and that it was understood that the name of the town was to be 'Albion.' In this he is corroborated by midshipman Daniel Southwell, who wrote on 12 July 1788 'The plan of a town is laying out, in which I believe the ingenious Mr Dawes is particularly engaged. Whether the name is yet determined on, I cannot tell, but have heard Albion mentioned upon this occasion.'



Sydney Cove on 1 March 1788. From a sketch in Bradley's journal.

In forming the settlement Governor Phillip was greatly hampered by the lack of artificers. He was obliged to employ carpenters from the *Sirius* and other ships to erect huts for the marines, while from 70 to 100 convicts were building their own quarters with the assistance of detachments of the marines; but that he made an attempt to lay out the town on generous lines is shown by the plan which he enclosed in a despatch dated 9 July 1788. The despatch stated that he intended the streets to be 200 feet wide, and that the land for the erection of buildings was to be so granted that not more than one house should be built on each allotment, which was to be 60 feet wide and 150 feet deep. By these provisions he hoped to ensure uniformity in buildings and prevent narrowness of streets. When he quitted the colony he left a memorandum directing that no part of the town of Sydney should be leased, and that all ground within the area marked out for the township was to be considered the property of the government. In 1801 Governor King decided that leases might be granted for five years, and Bligh, when he arrived in 1807, complained that several of these leases had been renewed for 14 years, which 'caused much inconvenience, as the land was required for government use.' In 1792 a settler writing home stated that the bricks and tiles used in building were both of one colour, 'which make the buildings look quite romantic; those built of wood are whitewashed with pipeclay which is found in great quantities around Sydney.' There was not in the colony such a thing as a flight of stairs, except in the governor's house. Another writer observes that Major Grose, who was acting-governor after Phillip's departure, had made 'great improvements in Sydney, which then contained 700 comfortable huts, exclusive of brick buildings the property of the government. In August 1803 there is a record of the streets of Sydney being cleared by 80 soldiers of the New South Wales Corps in 21 days.

Early charts show that the first settlers clung to the Cove, the waters of which then reached as far up as Bridge-street. The Tank Stream (the 'rivulet' referred to by Collins), which rose in the vicinity of Hyde Park, was for many years the township's only source of water-supply, and as a consequence many government and general orders were issued prohibiting its pollution. In March 1797 a paling-fence had been put round the spring and the 'tanks'—the tanks were basins hewn in the rock near the intersection of the present Hunter- and Hamilton-street. In 1803 a stone bridge was constructed across the mouth of the stream; it replaced a wooden one.

Between the departure of Phillip and the arrival of Macquarie the growing town was somewhat neglected by the authorities and inhabitants. On 11 August 1810 Macquarie issued an order fixing the width of the streets at 50 feet, inclusive of a footway on each side, and ordaining that any houses encroaching should be removed and re-erected at the public expense, or be demolished, fair compensation being given. The order further directed that no person should erect a house or dwelling in the town of Sydney, whether on leasehold ground or otherwise, without previously obtaining his permission through James Meehan, the acting-surveyor. In another order, dated 6 October 1810, Macquarie authorized the division of the town into five separate districts, and the erection of proper watch-houses in each; names were also given to all the streets, which were no longer to be called 'rows.' The principal streets of the city run in a southerly direction from Sydney Cove, parallel to the ridges, and are crossed nearly at right angles by other streets, which terminate at a second and much more extensive cove known as Darling Harbour. Since 1805 ticket-of-leave men kept the roads in some kind of order, but after Macquarie's arrival the principal streets in the town were kept in repair by road-gangs. Toll-bars were erected and tolls collected for the upkeep of the roads. In 1818 the magistrates assembled to consider the state of the roads, and among the orders issued on 28 November 1818 was one that narrow tyres must pay double tolls. George-street was paved in September 1818, and in June 1819 orders were given for the construction of a new road to the Brickfields (now George-street south) to relieve the traffic on the main roads. During 1831-8 many improvements were carried out, especially in lower George-street and at the abrupt elbow at the junction of Parramatta-street where George- and Pitt-street abutted on the Cleveland paddocks. During Sir Richard

Bourke's administration (1831-7) the authorities recommended for the streets of the city a width consistent with modern ideas. Unfortunately this was not carried out in Sydney, though it was given effect to in the laying out of Melbourne and other towns. In 1834 Bourke's council passed an act for regulating the alignment of the streets of the town of Sydney, and altering and improving the roads throughout New South Wales. After the passing of this act no one was permitted to erect a building of any kind in the town of Sydney within 12 ft. of the exterior edge of the kerb, and no house or building could be put up without notifying to the town surveyor the position and kind of building contemplated. On 20 July 1842 the municipal council of Sydney was incorporated by Act 6 Vict. No. 3 (an act to declare the town of Sydney to be a city and to incorporate the inhabitants thereof). Under its provisions the city was divided into six wards named Gipps, Bourke, Brisbane, Macquarie, Cook, and Phillip. Alderman John Hosking was the first mayor, and Charles H. Chambers, the first town clerk, was appointed on 16 November 1842. In the fifties the government was so dissatisfied with the administration of civic affairs that it placed the city under the control of three 'city commissioners.' These were Gilbert Elliott, Fred O. Darvall, and John Rae, who held office for the three years 1854-6 and made comprehensive and systematic improvements. Three pumping engines were ordered to augment the water-supply from Botany, and for about 40 years Sydney was served from this source; the commissioners, however, were not so successful with their sewerage system, which discharged into the harbour at Fort Macquarie (see WATER-SUPPLY AND SEWERAGE). It was originally intended to erect a town hall on a site which had been allotted in Bridge-street, but it was afterwards decided that the George-street burial-ground should be substituted for it, and there the present town hall was erected. After the commissioners had ruled for three years they were superseded, and a new corporation was elected in 1857, with George Thornton as mayor.

When the inhabitants were counted in September 1788 the population of Sydney was found to be 933. In July 1804 the population (including that of the dependent settlement at the Hawkesbury River) was 6928; on 1 March 1851 Sydney and suburbs contained 53,924. The population at 31 December 1925 was:—city of Sydney, 106,350; Sydney and suburbs, 933,040 (see POPULATION, GROWTH OF). In 1804 the total number of houses in Sydney was 678 (including military 160), 72 at the Brickfields, 18 at Cockle Bay, and 8 at Farm Cove. On 1 March 1851 there were 10,750 in the city and suburbs; in 1925 there were 16,294 buildings in the city and 202,930 in the suburbs.

On 7 April 1826 the first street lamp that had been erected was lighted in Macquarie-place; the erection of lamp-posts went on until on 20 January 1827 tenders were called for the lighting of 100 street lamps. After the incorporation of the Australian Gas Light Company in 1837, arrangements for the lighting of the city by gas were considered, and Queen Victoria's birthday in 1841 was celebrated by its inauguration. The city was lit with electric light in 1904.

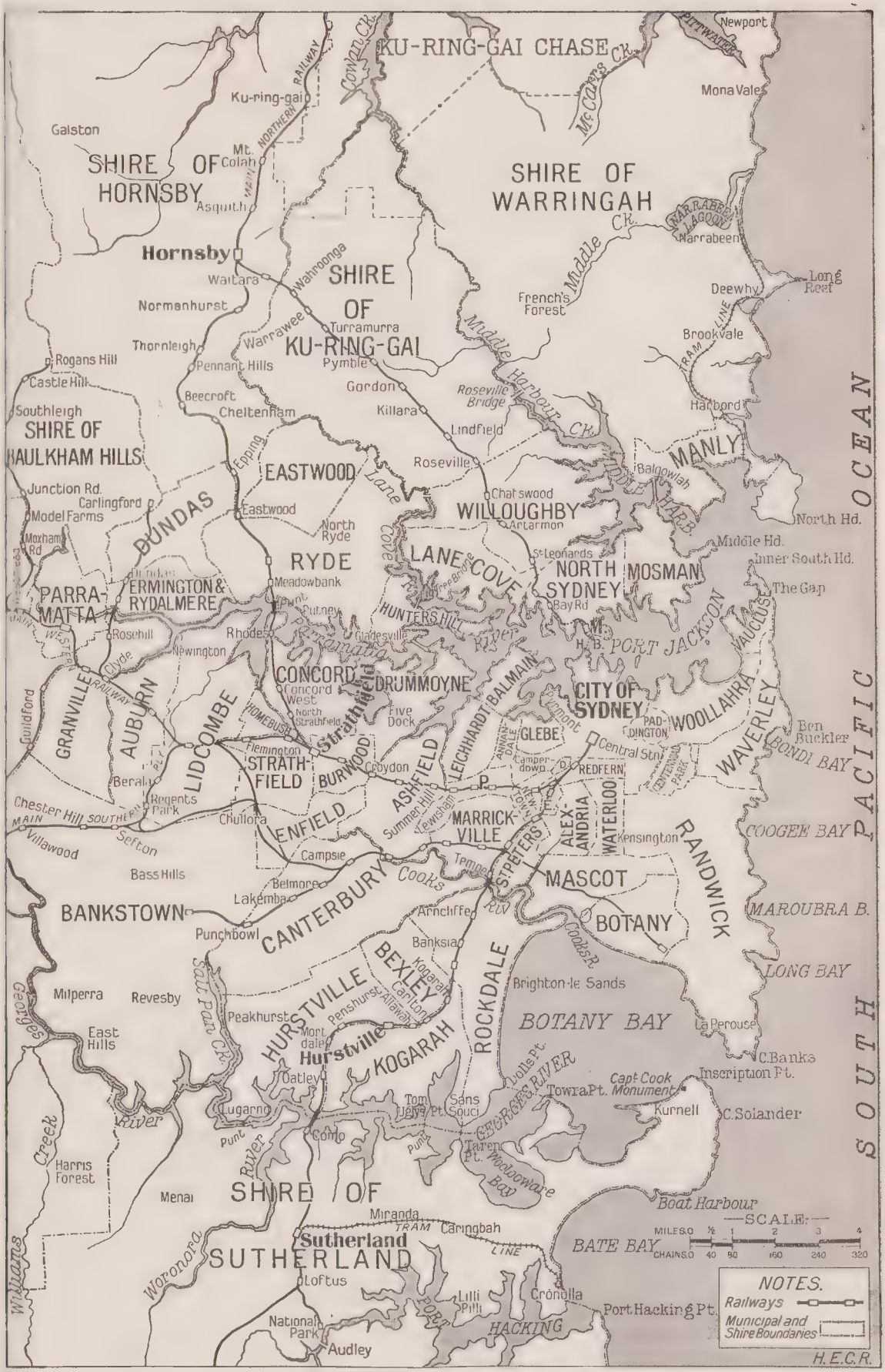
The first foundation-stone ceremoniously laid in Sydney was that of Phillip's government house. The copper plate attached to it was dug up in 1899 at the corner of Phillip- and Bridge-street, the inscription being:—

His Excellency
ARTHUR PHILLIP, Esqr,
Governor in Chief,
and
Captain General,
in and over the Territory of
NEW SOUTH WALES, &c, &c, &c,
landed in this Cove
with the first Settlers of this Country,
the 24th. Day of January; 1788,
and on the 15th. Day of May,
in the same Year, being the 28th,
of the Reign of His present Majesty,
GEORGE the THIRD,
the first of these Stones was laid.

The erection of huts for the convicts, barracks for the marines, a gaol, and a hospital for the sick absorbed all the man-power Phillip had at his disposal, and it was not until 1793 that a church was erected. The chaplain, Richard Johnson, erected a temporary church 'at the back of the huts' near to what is now the corner of Castlereagh- and Hunter-street. The site of this first church is now marked by a monument. The building was finished on 25 August 1793, but in 1798 it was burnt down. The use of a brick store 'not finished' was then granted to him and was fitted up as a church. On 29 October 1821 Macquarie laid the foundation-stone of what was then known as St. Mary's chapel, the erection of which was greatly aided by a handsome government donation. The foundation-stone of the Church of England cathedral was laid in August 1819, and on 16 May 1837 was relaid by Bourke.

In Governor Bligh's time a government and general order dated 23 August 1806, directed that markets should be established on a space near Queen's wharf. On 14 February 1809 these markets were closed, being inconvenient, and Lieutenant-governor Paterson directed that the old parade-ground at Church Hill should be used from 1 March 1809. The military, however, complained of their proximity to the barracks, and Macquarie on 25 October 1810 removed them to the site now occupied by the Queen Victoria markets. For 19 years this market served for the sale of all manner of merchandise and live stock, but on 19 June 1829 Governor Darling ordered the establishment of a cattle-market in the vicinity of the Brickfields. The imposing Queen Victoria markets, erected at a cost of £265,287, were opened on 21 July 1898; what was the cattle-market has been rebuilt and is known now as Belmore markets.

Only one horse, three mares, and three colts came with the First Fleet, and Collins gives a vivid description of the dragging by convicts of carts loaded with bricks and tiles from the Brickfields. Parramatta was reached by boat, the watermen's charge being regulated by the government. It was not until 1821 that the first stage-coach, the 'Eclipse,' was landed in Australia, to run between Sydney and Parramatta. On 15 November 1830 the first hackney-coach was landed, and had its stand near the King's wharf. In 1859 an act was passed by the legislative assembly for the construction of a horse-tramway to connect the railway-station with Circular Quay, and £7500 was voted for it. The line was opened on 23 December 1861. Steam locomotives, running on grooved rails, superseded the horse-trams in 1879, and a cable



SYDNEY AND SUBURBS

D. Darlington. E. Erskineville. P. Petersham. H.B. Site of harbour bridge. M. Milson's Point.

tramway on the North Shore was opened on 22 May 1886. The first electric tramway was opened on 8 December 1899, and that system is now in operation everywhere (see RAILWAYS AND TRAMWAYS). The telephone was introduced in 1881 (see POSTS AND TELEGRAPHS).

In the early days of the settlement few could assemble without authority, and to be found abroad at night was a punishable offence. Sydney's first public holiday was 7 February 1788, when Governor Phillip's commission was read; each man received one pint of rum and every woman half a pint, and despite the fact recorded by Tench that it was 'very ill flavoured and unpalatable,' it was found very acceptable by the convicts. On 4 June 1788 the King's birthday was celebrated, the convicts receiving 'an allowance of grog' and three days' holiday; 'loyal conviviality dictated every sentiment of the officers and privates.' In 1789 the first dramatic performance was given (see DRAMA). Lampooning was one of Sydney's earliest delights, a lampoon being a satirical squib sometimes called a 'pipe' (see 'PIPES'). Governor King was much incensed by certain lampoons, and at a later date Lieutenant-colonel Molle suffered under the same infliction. Péron, the French naturalist who visited Sydney in 1802, informs us that billiards were played in a kind of coffee-house kept by general subscription. Anniversary day, and the king's or queen's birthday, were celebrated by dinners at which odes suitable to the occasion were recited. On 31 December 1822 Macquarie's birthday was celebrated in this manner, and at a later period 'a ball and supper' were given on such occasions. Sydney was illuminated and bonfires were lighted in honour of Bourke's arrival on 2 December 1831. With Macquarie and the 73rd regiment came the establishment of sport. In October 1810 the first race-meeting was held, and a ball was given in the evening. The racecourse was in Hyde Park, and three days' holiday were given and orders were issued that no drink was to be sold on the course. In 1811 trotting matches were introduced, and in 1825 the Sydney Turf Club was formed (see RACING).

The government in 1900 resumed the whole of the water-front in the business area and erected modern wharves with proper approaches. To-day Sydney is the fifth port in the British Empire, and as a city with a white population she ranks third. A contract was let in 1924 for the erection of a bridge to span Sydney harbour; this is to be completed in 1930 (see SYDNEY HARBOUR BRIDGE). An underground city railway is in course of construction, and the first section will be opened in 1927 (see RAILWAYS AND TRAMWAYS).

Port Jackson has a shore-line of 183 miles, an area of about 22 square miles, and deep-sea liners can anchor in over 1000 acres of it. Writing to Lord Sydney in 1788, Governor Phillip said that he had had 'the satisfaction of finding the finest harbour in the world,' an opinion which, if we are to believe travellers' tales, is still endorsed in Sydney. The growth of Sydney has proceeded along definite lines. At first large grants were given on the borders of the city. As the population increased these were cut up and sold, and villages came into being. The villages developed and became municipalities, and Sydney, with these suburbs, now occupies an area of 118,299 acres, with well-populated outlying districts which will some day join up and make of her another London. C.H.B.

THE FOLLOWING TABLE SHOWS THE POPULATION OF THE METROPOLIS OF SYDNEY, 1861-1925:—

Year.	Males.	Females.	Total.	Annual rate of increase.	Proportion of population of State residing in metropolis
				per cent	per cent
1861	47,778	49,283	97,061	2.95	27.66
1871	68,266	70,913	139,179	3.67	27.62
1881	114,936	112,230	227,166	5.02	30.23
1891	197,550	189,884	387,434	5.48	34.22
1901	241,700	246,232	487,932	2.33	35.90
1911	312,086	324,302	636,388	2.69	38.56
1921	439,691	466,412	906,103	3.60	43.11
1925	508,790	530,600	1,039,390	2.70	45.20

Sydney Gazette and New South Wales Advertiser, THE. The first number was published on 5 March 1803. The paper appeared weekly until the end of 1825, twice a week until 1827, and thrice a week until 20 October 1842, when it died. It was edited by George Howe (q.v.) until 11 May 1821; then by Robert Howe (q.v.) until 29 January 1829; by Ralph Mansfield (q.v.) until 30 June 1832; then by George Thomas Graham, Henry Carmichael, Edward William O'Shaughnessy, William Watt (who afterwards married Mrs. George Howe), George Cavanour, and others.

The *Gazette* was the first Australian newspaper, and it is the only record of current events up to 1824. On 9 May 1803 Governor King wrote to Lord Hobart:

It being desirable that the settlers and inhabitants at large should be benefitted by useful information being dispersed among them, I considered that a weekly publication would greatly facilitate that design, for which purpose I gave permission to an ingenious man, who manages the Government printing press, to collect materials weekly, which, being inspected by an officer, is published in the form of a weekly newspaper.

In his opening address George Howe, the printer-editor, said:

Innumerable as the obstacles were which threatened to oppose our undertaking, yet we are happy to affirm that they [were] not insurmountable, however difficult the task before us. The utility of a PAPER in the COLONY, as it must open a source of solid information, will, we hope, be universally felt and acknowledged. We have courted the assistance of the Ingenious and Intelligent: . . . . We open no channel to Political Discussion or Personal Animadversion. Information is our only Purpose; that accomplished, we shall consider that we have done our duty, in an exertion to merit the Approbation of the Public, and to secure a liberal Patronage to the SYDNEY GAZETTE.

No. 1 consisted of four 13 x 9 in. pages, each

containing three columns; although the paper, type, and ink were not of the best, they served (the facsimile of vol. 1 referred to below is much more easily read than the original), and George Howe was soon rewarded by a circulation of 300 weekly at 1s. each. It was issued on Saturdays up to 10 April, when it became a Sunday paper and continued as such till 17 February 1810; then it reverted to publication on Saturdays. Although George Howe was its proprietor, the paper was the official organ of the executive, and this obliged him to publish only what the rulers sanctioned—liberty of the press did not come to New South Wales for nearly 20 years, and only then after much persecution. For the first seven years Howe's trials were legion. Paper was difficult to obtain, and from time to time the size, shape, and colour of the *Gazette* varied considerably. In 1809, owing to the bad debts incurred, Foveaux in a general order dated 14 December came to the poor printer's help, saying:

> It having been represented that in Consequence of numerous Sums being in Arrear to the Publisher of the *Sydney Gazette and New South Wales Advertiser*, the Publication thereof is threatened with Interruption unless those arrears be immediately paid off. His Honour, the Lieutenant Governor, is pleased to direct that the Stores at the various Settlements be always open for the Receipt of Grain to the Amount of sums due upon that Account. And as it is His Honour's Wish to strengthen as much as possible the prospect of its uninterrupted Continuance, he is further pleased to recommend Punctuality in the Discharge of Subscriptions, &c., without which the Publisher must always be exposed to Inconveniences, against which he has been under the necessity of complaining that his circumstances are unable to contend.

Later on Howe was about to suspend publication when Macquarie came to his rescue with a grant of £60 per annum; this enabled him to reconstruct, and to import a better type and press. In July 1810 a 4-page number was issued, but with this exception, and a few 4-page issues in the following year, the ordinary issue was of two pages, and supplements were issued occasionally. Vol. 1 (5 March 1803-26 February 1804) has been reproduced in facsimile (Sydney, 1899).

Sydney Harbour Bridge. The first proposal for a bridge between Sydney and the North Shore was made in 1815 by F. H. Greenway (q.v.), but he gave no details of the method by which, with the appliances of those days, he intended to span a channel nearly half a mile wide and from 50 to 70 feet deep. The earliest-known drawing of such a bridge was made in 1857 by Peter Henderson, who planned his bridge, roughly speaking, from Dawes Point to Milson's Point. In 1878 W. C. Bennett, then commissioner for roads and bridges, favoured a floating bridge from Dawes Point to Milson's Point, to carry vehicles, passengers, and, if necessary, a railway train. In 1879 T. S. Parrott designed a truss-bridge of seven spans (the longest span being 500 feet) between the same terminals. In 1880 negotiations were opened between the colonial government and a company which was prepared to construct a high-level bridge to the North Shore at a cost of £850,000, on condition that the government guaranteed, for a period of 30 years, an amount equal to 3½ per cent upon the cost of construction. Nothing came of this, and a few years later Sir John Fowler prepared plans for a suspension bridge to carry vehicular traffic, at an estimated cost of £400,000.

A tunnel to North Sydney was first proposed in 1885, when C. O'Neill and C. E. Gipps prepared designs; in 1887 the government was asked to guarantee four per cent on the cost of two tunnels, one for railway traffic, one for road traffic. In January 1888 Sir Henry Parkes was urged to build a bridge by way of celebrating the colony's centenary year. Parkes actually fought and won an election on the cry

> Now, who will stand at my right hand
> And build the Bridge with me?

In March 1890 a royal commission was appointed to investigate a proposed extension of the railway into the city and its connection with North Sydney. Eight bridge schemes were submitted and at least four varieties of tunnel. The commission reported against any immediate attempt to connect the North Shore with Sydney, adding that any future connection should be made by a high-level bridge, if possible in one span.

Between 1896 and 1899 four bills—two for bridges, two for tunnels—were placed before the legislature with the object of securing the connection by private enterprise. No progress was made with any of them. In January 1900 E. W. O'Sullivan (q.v.), then minister for public works, called for competitive designs and tenders; as none of the designs received was considered satisfactory, he on 25 March 1901 appointed an advisory board, which planned a bridge from Dawes Point to McMahon's Point and called for competitive designs and tenders throughout the world. In November 1903 the board recommended the acceptance of a tender for £1,940,050, but by that time O'Sullivan was out of office, and his successor put the matter aside.

In 1908 a royal commission reported in favour of separate subways for railway, tramway, and vehicular traffic, allowing 40 feet of water above the subways at low water. Three years later Arthur Griffith, then minister for public works, announced in July 1911 that a definite proposal for a bridge to carry tramway, vehicular, and pedestrian traffic, but not a railway, would be submitted immediately to the public works committee, and concurrently with that, a proposal for a subway to connect the North Sydney railway-system with the city system; the bridge was to run to McMahon's Point, the subway from Fort Macquarie on the eastern side of Circular Quay to the head of Lavender Bay. This enquiry by the public works committee was in fact the first step towards the bridge now being erected. During it J. J. C. Bradfield discouraged the subway proposal as likely to block the deep-water channel, and proposed a cantilever bridge without any piers in the fairway from Dawes Point to Milson's Point. David Hay, an eminent Scottish engineer with great experience of subways, who had been brought to Sydney by the State government to report on traffic problems, supported Bradfield's contentions, and the committee in 1913 accepted the new bridge proposal. In 1916 the necessary bill twice passed the assembly and was twice rejected by the legislative council; during the next few years, when war-conditions made any immediate action impossible, Bradfield worked out both full specifications for his bridge and a scheme for financing it (partly by a betterment tax on land on both sides of the harbour which the bridge would benefit); in 1921 he worked out alternative specifications for an arch-bridge—a more rigid but less easily constructed type—and in 1922 visited Europe to consult practical bridge-builders about the possibility of constructing so huge a span;

in November 1922 the necessary act was at last passed, and on 24 March 1924 the tender of Dorman, Long and Co. for £4,217,721 11s. 10d. was accepted, the work to be completed in six years and to be wholly fabricated in Australia. See plate xl.

The length of the central span is 1650 ft.—650 ft. longer than any other arch-bridge in the world. The bridge will carry four lines of heavy electric railway-track, a roadway 57 ft. wide between kerbs, and two 10-ft. pathways. The over-all width of the bridge is 159 ft. 11¾ in. The headway for shipping is 172 ft. 6 in. at high water. Under the heaviest loading the bridge will have a deflection of about 4½ in. All the steelwork is being fabricated in Sydney in shops specially erected on the foreshores of Lavender Bay; the steel (except the plates and the heavy chord angles) is being manufactured in the State; granite for the facings of the abutment towers and pylons is obtained from Moruya, and the cement is of local manufacture.

The span of the two-hinged arch is 1650 ft. between centres of end-pins; there are 28 panels, each of 58 ft. 11 in. The distance from centre to centre of skewbacks is 1670 ft., the rise of the arch at crown 250 ft., the depth of the truss at centre 60 ft. and at bearings 188 ft. All members will be constructed of silicon steel. The upper chords will have four webs 40½ in. deep over angles and 11 ft. wide over flanges; the angles will be 12 in. by 12 in. by ¾ in. and 8 in. by 8 in. by ¾ in; the maximun thickness of the plates will be 2 in. The lower chord will have four webs 48 in. deep over angles at crown and 99 in. deep over bearings; the plates will be 11 ft. wide, angles 12 in. by 12 in. by 1¼ in. (the largest section of angle yet rolled), and the web-plates will be 2 to 4½ in. thick. The maximum thrust at hinges is 43,500,000 lb. per hinge.

There are five approach-spans on each side. On the south there are one span of 238 ft. and four spans of 174 ft. 6 in. (depth of trusses 35 ft.); on the north the approach-spans are on a curve, the western trusses being approximately 161 ft. 6 in. long and the eastern trusses 173 ft. 2 in.

The heaviest member of the Forth bridge in Scotland has an area in section of 800 sq. in.; of the Hell Gate bridge at New York, 1392 sq. in.; of the Quebec bridge—the largest span cantilever bridge in the world—1941 sq. in. The heaviest member in the Sydney bridge will have a sectional area of 2450 sq. in., more than three times the area of the heaviest member in the Forth bridge. W.F.B.

Sydney, H.M.A.S. See NAVAL DEFENCE.

Syme, DAVID (1827-1908), born on 2 October 1827 at North Berwick in Scotland and educated at home by his father, studied theology under James Morison of Kilmarnock and philosophy at the university of Heidelberg, and in 1850 became reader on a Glasgow newspaper. The hope of greater opportunities on the goldfields attracted him at first to California (1851) and then to Melbourne (1852), and for some time he prospected on various diggings; but in 1856 he returned to Melbourne to join his brother Ebenezer, who had gone straight to Melbourne in 1852, written for the *Argus*, and become editor of the *Age*—then owned by a co-operative society of journalists and printers. From this society the brothers bought the *Age* for £2000, Ebenezer continuing to edit it while David undertook the management; a year's trial, however, showed that the paper could not support both owners, and David became a road-contractor.

In 1860, just when the contracts were beginning to pay, Ebenezer died and David found it necessary to return to the *Age* office. From that time to his death he devoted himself to the paper, which for 48 years was the reflection of his personal opinions. He made it the organ of the advanced radicals, demanding the cutting up of large estates to provide land for small farmers, a protective tariff to develop secondary industries and ensure adequate wages for artisans, and the introduction of manhood suffrage and diminution of the powers of the legislative council in order to facilitate the passing of the other measures. Payment of members and a system of free, compulsory, and secular education were also on his programme, nearly every item of which he saw carried out during his life. By the 1880s he was the dominant power in the colony, could force the abandonment of important bills and the dismissal of high officials (e.g. of Richard Speight, the chief railway commissioner, in 1892), and despatched J. L. Dow to the United States and Alfred Deakin (q.v.) to India to report on agricultural and irrigationist methods suitable for adoption in Victoria. When in 1889 Sir Henry Parkes resuscitated federation, Syme at first encouraged the Victorian premier, Duncan Gillies, to disregard it and advocate a mere enlargement of the existing federal council; but by 1895, when the Reid proposals for an elected convention were put forward, he had adopted in full the cause of federation and advocated the supremacy of the new nation over any combination of colonies. If the *Age* did not for some time wholeheartedly support the convention's draft bill, it was because Syme considered that too many concessions had been made to the smaller colonies. In the end, however, he accepted and backed the bill as the best obtainable and a great democratic advance on existing colonial constitutions. After the Commonwealth came into existence Syme took up the cause of national defence, to comprise universal compulsory military service and a locally owned and manned flotilla for coastal protection. Before he could see this policy carried into effect, he died at Kew near Melbourne on 14 February 1908.

While his life was bound up with his newspaper, he found time at intervals to write on economics and philosophy, publishing in 1877 *Outlines of an Industrial Science*, in 1882 *Representative Government in England*, in 1890 *On the Modification of Organisms*, and in 1903 *The Soul*—all carefully studied and interesting expositions of his ideas and beliefs.

Symon, SIR JOSIAH HENRY, born at Wick in Scotland on 27 September 1846 and educated at Stirling and Edinburgh, migrated to South Australia in 1866, was called to the local bar in 1871, and became a Q.C. in 1881. In the same year he entered the assembly as member for Sturt and attorney-general in the short-lived Morgan ministry. From that year to 1884 he was leader of the opposition, in 1885 refused a judgeship of the supreme court, and in 1887 left local politics altogether; but he had already thrown himself into the fight for federation, condemning the proposals for a federal council as likely to retard the genuine movement, and from 1887 onwards was president of the South Australian Federation League and of the Common-

wealth League. Elected by his colony a delegate to the convention of 1897-8, he was made chairman of its judiciary committee, and there steadily advocated the right of the federal high court to have the final determination of constitutional questions (see FEDERATION); in the general debates of the convention he vigorously attempted to protect the smaller colonies against domination by the more populous. In 1899 he visited London to confer with the colonial office on the new constitution, thus easing the task of the official delegates who arrived in 1900. At the first federal elections, in 1901, he headed the poll for senators from his State (as he did in 1906), and became leader of the opposition in the new senate; it was mainly owing to his support that, against considerable opposition both inside and outside parliament, the federal judiciary was established. As attorney-general in the Reid-McLean ministry of 1904-5 he carried through parliament a sea carriage of goods act and the first federal measure directed against industrial disputes. Later he resumed for a time the opposition leadership in the senate, but abandoned it owing to the pressure of professional work, and in 1913 retired from politics; before this, however, in 1909, he had during a visit to London greatly assisted the Fisher ministry in settling with the Imperial authorities the provisions and scope of the local naval discipline act. Outside politics his chief interests have been educational, and he was for many years a member of council of the university of Adelaide. During the war he organized in his State a Red Cross information bureau for the friends of men at the front. His vineyard at Auldana is one of the best-known in Australia, and his work as an orchardist and a breeder of pedigree live stock has notably benefited his State. (K.C.M.G., 1901.)

Symphyonema, an extra-tropical genus of the family Proteaceae, consisting of two species of small shrubs endemic in eastern Australia. The flowers are small, yellowish, pleasingly scented, in slender spikes; corolla cylindrical in bud, with free segments; stalks of the anthers incurved and united in a ring round the style, the anthers free and erect; fruit an oblong nut, usually with only one fertile seed; leaves narrowly segmented. *S. montanum* displays a preference for a sub-alpine habitat; *S. paludosum* is a swamp-dweller.

Syncarpia, a genus of the family Myrtaceae, consisting of 2 species of trees endemic in eastern Australia. The flowers are in dense globular heads; calyx-tube bell-shaped, 4- (rarely 5-) lobed, persistent; petals 4-5; stamens free in 1 or 2 series; capsules opening in 2 or 3 valves; leaves opposite, feather-veined. *S. laurifolia* (Turpentine Tree), yields a non-inflammable oleo-resin similar to Venice turpentine in colour (a rich reddish-brown). The native bees carry off this exudation assiduously. Turpentine timber is valuable for shipbuilding, wharf-piles, and other maritime construction, owing to its capacity for resisting attack by the dreaded shipworm, *Teredo navalis*; it also resists white ants and damp. The wood is difficult to burn, as it will only char; it was therefore much in demand for beams, girders, and pillars in stores and warehouses, but the demand has fallen off

Turpentine Tree.

since the advent of reinforced concrete. A peculiarity of *S. laurifolia* is its predilection for shale formations. The fruits of this species are united at the base and form globular heads; in *S. leptopetala* (Brush Turpentine) the fruits are separate.

T

Taccaceae, a family limited to a single (chiefly tropical) genus, *Tacca*, which consists of herbs with a tuberous creeping stem, branched leaves twice or thrice divided, and clustered flowers on a stalk rising from a sheathing stem. The fruit is a globular berry. The only species indigenous to Australia is *T. pinnatifida*, which has a wide range in Malaysia and is found in Queensland and northern Australia. The roots, when raw, are very bitter, but yield a large quantity of arrowroot, of which good flour for confectionery is made: it is very nutritious, and is considered preferable to any other form of arrowroot for dysentery.

Tailor, an important food and game fish (*Pomatomus saltatrix*) of the family Pomatomidae, which occurs plentifully off-shore and in the estuaries of all the Australian States. It has also a very wide distribution outside Australian waters, occurring in both the Atlantic and Indian oceans and occasionally entering the Mediterranean. On the eastern coast of America it is known as 'bluefish,' and is one of the commonest and most highly-prized fishes found in those waters. Although the name 'tailor' is commonly applied to this species in most Australian States, in Victoria and Western Australia it is more widely known as 'skipjack.' As a food-fish the tailor is of excellent quality, but deteriorates rapidly and must be eaten soon after capture to be thoroughly appreciated. Its keeping qualities are greatly enhanced if it is cleaned and bled soon after its removal from the water. As a sporting-fish the tailor is much sought after, for it bites freely and is a game fighter and fast swimmer. It is usually fished for by trolling behind a launch with fish-bait, spoons, or spinners; the line is often sheathed for a few inches above the hook with thin lead, or otherwise protected against the sharp teeth which enable the tailor to sever the strongest lines with ease. For sheer greed and voracity the tailor is probably without a peer, and great quantities of other fishes (such as mullet and herrings) are slaughtered to appease its appetite.

The market is supplied principally by net fishermen, the hauling-net (seine) being chiefly employed. Much damage is frequently done to the nets, as the fish cut holes in them in their efforts to escape; this habit probably accounts for its vernacular name, since its capacity for easy and rapid cutting has been likened to that of a tailor's shears. In some quarters the name is written 'tailer,' under the influence of a belief that the fish 'tails' or follows its prey; this is erroneous, for it always strikes across or at right angles to the course its prey is pursuing. The tailor may attain a length of upwards of three feet, and a weight of 15lb.; the average weight of those marketed is, however, three or four pounds. Considerable quantities are smoked—in which condition the tailor is probably unsurpassed among Australian fishes.

T.C.R.

Talbot, Sir Reginald Arthur James, born on 11 July 1841 and educated at Harrow, in 1859 entered the 1st Life Guards (sub-lieutenant, 1859; lieutenant, 1863; captain, 1867; major, 1881; lieutenant-colonel, 1882; colonel, 1885; major-general, 1898). He saw active service during the Zulu war in 1879, in the Egyptian campaign of 1882, and with the Nile expedition in 1885-6. From 1889 to 1895 he was military attaché at Paris, in 1896 was given command of the cavalry brigade at Aldershot, and from 1899 to 1903 commanded the army of occupation in Egypt. In 1903 he was appointed governor of Victoria—he had had political experience as member of parliament for Stafford in 1869-74. He was sworn in as governor on 25 April 1904, and relinquished office on 6 July 1908. On his return to England he retired from public life. (C.B., 1885; K.C.B., 1902.)

Tallegalane. See Mullet, Gray.

Tallow-wood. See Timbers.

Tang. See Chats.

Tank Stream. See Sydney and Water-supply.

Tanning. See Vegetable Products, Kent, Thomas, and Lord, Simeon.

Tantalite. See Mineralogy.

Tapeworms, vernacular name of the class Cestoda of the phylum Platyhelminthes, for which see Flat-worms. They are internal parasites in vertebrate animals, with a narrow head bearing suckers and (usually) hooks for attachment to the wall of the host's alimentary canal, followed by a long series of similar segments, each of which carries a full complement of hermaphrodite reproductive organs and is comparable to an individual trematode. Adult tapeworms occur in the alimentary canals of nearly all vertebrates. The most striking feature of the group is the entire absence of an alimentary canal, food being absorbed through the general surface of the body.

The life-history is complex, and demands the intervention of an intermediate host, which may be vertebrate or invertebrate, and which frequently serves as food for the final host. Thus the larval forms of the common tapeworms of man are found in the pig and the ox.

One of the tapeworms of man (*Taenia solium*) may attain a length of six to eight yards, and consist of upwards of a thousand segments. The posterior segments, when they have become filled with eggs, drop off and pass to the exterior with the faeces. If a segment, or portion

of it, be taken in by a pig, a minute embryo armed with six hooks hatches out, bores its way through the wall of the alimentary tube, and reaches the voluntary muscles, where it increases in size and becomes a hollow cyst; at one point of this an invagination occurs, in which are formed the suckers and hooks of a tapeworm head. If this bladder-worm stage be taken alive into the stomach of man, through eating insufficiently cooked pork, the head becomes pushed out, the bladder is dropped, and the parasite fixes itself to the intestinal wall and grows to the adult condition.

Of more importance, because of the ravages it causes, is the hydatid tapeworm (*T. echinococcus*). The adult worm, which occurs in the dog, is very small, consisting of three or four segments only. The eggs, which pass out with the faeces, can undergo development in many animals, including man, who becomes infected by contaminated drinking-water, unwashed salad-vegetables, etc. The bladder-worm stage differs from that of *T. solium* in that the original cyst grows to a much larger size and, instead of forming a single tapeworm head, buds off daughter-cysts which remain attached, and each of which gives rise to many heads. This proliferation may take place in the liver, lungs, or other organs, and can be treated only by surgical operation. Another tapeworm of the dog, *T. serialis*, has a somewhat similar proliferating cystic form, which occurs under the skin in rabbits. Tapeworms in the intestine of man and animals are treated by means of vermifuges, of which areca-nut, male-fern, and thymol are the most efficacious. T. Harvey Johnston of Adelaide has described a number of tapeworms from Australian frogs, reptiles, birds, and mammals, both marsupial and monotreme.

See *Proceedings* of the Royal Society of Queensland; *Proceedings* of the Royal Society of New South Wales; *Memoirs of the Queensland Museum*; *Proceedings* of the Linnean Society of New South Wales; and the *Report* for 1913 of the Australian Institute of Tropical Medicine.

L.H.

The special importance of *T. echinococcus* is due to its connection with hydatid disease, which is more prevalent in Australia than in any other part of the world except Iceland. It occurs in the country rather than the cities, and in inland rather than in coastal areas. When its eggs reach the alimentary canal of a human being, they hatch out an embryo which perforates the surrounding tissues and may settle itself in any part of the body—the liver is its most usual resort. Once settled, it forms a 'hydatid cyst,' which increases in size and soon exerts mechanical pressure on the organs in its neighbourhood; the ill effects are more or less grave according to the situation of the cyst, severe symptoms and even death resulting from the presence of a very small cyst in the brain, whereas in some parts of the trunk one the size of a man's head may sometimes be tolerated. The cysts contain a clear watery fluid and frequently 'daughter cysts,' and the rupture of one inside the body may have serious consequences.

The treatment of hydatid disease is purely surgical. Drugs are useless. Precautions against it should take the form of a very careful handling of dogs, which, as has been already pointed out, are the hosts of the adult worm. Sheep, cattle, and pigs are liable to the disease, and dogs that feed on the diseased parts of these animals may convey the infection to human beings. It is therefore necessary (*a*) not to allow dogs access to slaughter-houses; (*b*) not to feed them on raw meat—or at any rate on condemned meat; (*c*) not to let children handle dogs freely, especially in country districts; (*d*) always to wash the hands thoroughly after handling dogs and before handling food. Dogs used among stock should be periodically treated with a reliable vermifuge. Salads and other raw vegetables must be carefully washed in running water before eating, and water from stagnant pools must always be boiled before drinking.

W.G.A.

Tariffs. The story of tariff policy in Australia may be divided into three periods, the first ending about 1860, the second at the inauguration of the Commonwealth.

A. (1788-1860). The early governors obtained much of their revenue by imposing customs duties. A preferential rate was usually conceded to British goods: for instance, foreign spirits entering Tasmania in 1836 paid 12s. a gallon, whereas British spirits paid only 9s., and a 5 per cent duty on imported merchandise was waived entirely for British manufactures. This, however, was a revenue tariff; no one then thought of giving protection to local industries. When full self-government came in the fifties, the same policy was followed; the revenue from gold was large, and there was little need for income from customs. Further, most public men in the fifties were steeped in the free-trade ideas that ruled England, and the tendency was towards a low revenue-tariff on a few commodities.

B. (1860-1900). During this period each of the six colonies developed its own tariff policy, ranging from the low revenue-tariff of New South Wales to the high protective duties of Victoria.

Victoria's adoption of protection was due to two factors. The gold output declined after 1856, for the alluvial deposits were becoming less productive, their output in 1866 being only half that of 1856. Hence less revenue came in from the export-tax on gold, unemployment grew, and depression and migration to the other colonies increased. Victorian towns were crowded with men out of work, relief-pay or employment of some sort had to be provided, and the outlook for the colony was gray. But one may well doubt if even these conditions would have led to protection, had it not been for David Syme (q.v.). Syme had become proprietor of the Melbourne *Age* in 1856; probably he had never accepted the gospel of *laissez-faire*, and he soon began to preach a fervid protectionism. His arguments are familiar:—Freetrade is a policy of drift, and leads to 'national disaster and social degeneration;' the national ideal should be 'a nicely balanced industrial community, composite, stable, and progressive: a self-contained, self-supporting independent nation,' capable of supplying all its requirements in time of war and of offering employment to every kind of talent; Victoria must exploit all its resources, and develop every industry for which climate, soil, or the possession of raw materials fitted it. All this could easily be done by imposing import duties: infant industries would inevitably appear if adequate protection was offered. To this 'infant industry' argument Syme later added the 'living wage' plea, saying that he would not be satisfied until Victoria had a tariff which would enable 'the local manufacturer to pay the local artisan a fair living wage, and at

the same time enable him successfully to compete in the local market with the imported productions of underpaid foreign labour.' Syme drove his way through apathy, ridicule, and bitter opposition, and after a sensational fight between the two Victorian houses of parliament a mildly protective tariff was enacted in 1866. The rates were raised and new duties imposed in 1877 and 1892, thus bringing the *ad valorem* charges up to 30, 40, or even 45 per cent on some goods, with specific duties in some cases as high as 100 to 200 per cent.

While Victoria tended more and more towards high protection, New South Wales seldom moved far from the free-trade position of the fifties; it was thought that Sydney would benefit by remaining a free port while Melbourne was customs-ridden; this consideration, plus a fine harbour and plenty of coal, would help New South Wales to become the leading industrial and commercial colony. There was no Syme in New South Wales; instead, there was Henry Parkes, who was just as vigorous an advocate of freetrade as Syme was of protection. Hence the commercial policy of New South Wales fluctuated very little. At times a protectionist ministry came into power, and a few high duties were imposed, but the return of the freetraders to power was always followed by the restoration of the *status quo ante*. The other colonies steered a middle course; some of them (especially South Australia) leaned towards a protective policy, but the local markets were so small that any large industrial development was impossible—protection was therefore not worth while, and their tariff rates never climbed so high as those of Victoria.

In the fiscal controversies of the eighties and nineties many attempts were made to compare the economic progress of Victoria with that of New South Wales, and to justify one or other of the rival policies in the light of this comparison. Such comparisons were almost futile; they failed to take into account the difference between the natural resources, land policy, immigration, railway and road development, and public borrowing of the two colonies. But certain conclusions, not necessarily of a comparative nature, can be reached. In both colonies a number of manufacturing industries grew up, and in 1901 each colony had over 3000 'factories,' and 66,000 factory employees. The goods manufactured were largely made from local primary products (e.g. butter, flour, leather, jam, candles); some were made locally because they were too bulky, perishable, cheap, or heavy to be imported (e.g. bricks, furniture, lorries and rolling-stock, joinery). Making and repairing machines also employed many workers, especially on mines and in railway workshops. Much of the work in these industries enjoys a natural protection and would probably have been performed in any free-trade colony. But Victoria also had some industries which were largely due to the protection of the tariff—remembering that her tariff operated against goods from the neighbouring colonies as well as from overseas. Perhaps the chief examples were the textile and apparel industries; actual cloth-making employed about 800 hands in 1890, and the heavy tariff on imported boots and garments allowed the market to be supplied chiefly from local production. It was generally admitted that Victoria had a greater diversity of manufactures than the other colonies; but revelations concerning the existence of sweating in the early nineties suggested that some of her industries had been built up on a foundation of underpaid labour.

During the second half of the 19th century the need for intercolonial reciprocity, and even for an Australian Zollverein, was widely recognized, but intercolonial jealousies and friction combined with vested interests to retard the development of economic federalism. At the custom-house each colony tended to treat its neighbours as foreigners, and the many intercolonial conferences failed to clear the tariff 'lion' from the path. Victorian factories would welcome an opportunity of winning wider markets, but feared that their own market might be filched from them by their rivals in New South Wales. Sydney was afraid that its Riverina trade might flow to Melbourne when once the barriers were down. At last, however, political as well as economic forces compelled the country to take the plunge in 1900, and the first federal parliament met in 1901.

C. (1901 and onwards.) This third epoch has been marked by the establishment of inter-State freetrade and the imposition of a uniform tariff over the whole continent. Internal trade has been further stimulated by the linking-up of boundary railway lines, the building of the transcontinental line, the development of motor transit, and improved inter-State coastal facilities. The locking of the Murray will allow river-traffic to be carried on all the year round. At the same time the growth of firms and banks with branches in the various States helps to link up trade between the capitals. Inter-State trade is hindered to some extent by heavy freights on rail or ship, and the local manufacturer is sometimes severely handicapped because the freight on his commodity, say from Melbourne to Perth, is as high as that on a rival article imported from London. The lack of direct shipping facilities between some States hinders trade, and the navigation act (see below) is seriously injuring certain branches of trade between the mainland and Tasmania and the possessions in the Pacific. Nevertheless, the benefits of a free continental market have been great, and some industries—e.g. steel, confectionery, clothing, printing and binding—can now operate on a scale sufficiently large to permit of the use of big plant and subdivision of labour. The tendency is for industries to settle near the chief markets (Sydney and Melbourne) or near fuel or power-supply—i.e. the coal-fields of New South Wales, the hydro-electric power area in Tasmania, the Yallourn (q.v.) sphere in Victoria—or near abundant supplies of raw material, as in the case of jam factories.

A uniform tariff on foreign goods was an essential concomitant of federation; but should the tariff be a revenue or a protective one? The Commonwealth government was taking over customs and excise as its chief source of revenue, but under the Braddon clause (q.v.) three-quarters of this revenue had to be handed back to the States, to compensate them for the customs revenue they lost by federating, and only the remaining quarter was available to defray the cost of federal government. The States required the return of £6,000,000, so £8,000,000 had to be collected from customs and excise, and a comprehensive schedule of duties was necessary. At the same time, although revenue was important, existing industries which had come into being behind the colonial tariffs must not be exposed to destruction; hence was reached the compromise of a moderate tariff which, in

the words of the first governor-general's speech, 'must necessarily operate protectively as well as for the production of revenue.' This first federal tariff encountered much parliamentary opposition from freetraders; as years went by, however, active opposition to protective duties almost disappeared, especially when freetraders began to combine with their old opponents in a common hostility to the increasingly strong Labour party; then the Labour party, at first divided on the question, finally swung over to protection, since it came to believe that only behind a high tariff wall could a high standard of living for wage-earners be secured. A Country party, which appeared after the war of 1914-18, protested against tariffs on farming equipment, but otherwise took little interest in the fiscal issue. Hence successive increases and extensions of the tariff schedule in 1907, 1914, 1920, and 1925 were accepted with a rapidly diminishing opposition, and fiscal discussion on broad general principles is now dead—except among advocates of the single-tax, on the one hand, and those who demand prohibitive rates on the other.

The Australian protective system—of which, as will be seen later, the tariff is only a part—is based on a growing nationalism, intense and rather conscious, which expresses itself in the cry 'Australia for the Australians,' in the belief that the country is better than any other land, and in the desire to have a national army, navy, manufactures, and culture. 'Shall Australia be a sheep-run or a nation?' asks a leading protectionist publication almost every week. From this desire for economic nationhood comes the desire to be self-sufficing, self-contained. A vast continent, with large and varied mineral resources, fertile soil, and climates ranging from tropical to temperate, is surely capable, say the protectionists, of producing all the primary and secondary products necessary for comfortable existence. To some it seems shameful that wool should be sent all the way to Yorkshire and then re-imported in the form of cloth. A nation dependent on others for its manufactured articles may, they think, be helpless in time of war; that was the lesson taught by the great war, and the ideal of 'a self-contained and symmetrically developed industrial community' won many more adherents. Beyond these political and sentimental arguments are several economic pleas. The 'infant-industry' argument still wins general acceptance. The 'standard-of-living' argument gains the votes of wage-earners. The fallacious belief obtains widely in journalistic and parliamentary discussions that when goods are bought from abroad, gold has to be sent out to pay for them.

The protective system built up under the influence of these ideas is many-sided. The tariff is part of a wider plan. Restrictions are placed on immigration, especially of non-British or coloured people, and of those who might, if admitted, work for lower wages than are enjoyed by Australian wage-earners. This policy has lost some of its force with the development of the minimum-living-wage principle in every State. The navigation act prevents overseas ships from engaging in inter-State trade, unless they are registered on the Australian shipping register and conform with the provisions of the act as regards passengers and crew. Bounties, too, are paid on the production of certain commodities; the act of 1907 provided for the payment of bounties on cotton, rice, tobacco, rubber, combed wool, etc., produced in Australia during the ensuing 15 years. Later, pig-iron, steel, steel products, kerosene, and paraffin wax were added to the list. The bounties, however, on agricultural tropical products were not availed of to any great extent, and the treatment of iron was little influenced by the offer of a bounty, so that bounties may be said to have been a negligible factor in industrial expansion. Special preference is granted in many instances to local tenderers for government contracts. An interesting attempt made in 1906 to ensure that the protected manufacturer should sell at a reasonable price to his customers, and pay a fair living-wage to his employees, is discussed under New Protection.

Imperial preference was introduced into the tariff of 1907, though discussion on the subject goes back at least to the Ottawa conference of 1894. The 1907 schedule increased protective duties almost all round (many being almost doubled) and then conceded a reduction of about 5 per cent on nearly 300 items of British origin. This preference affected about 60 per cent of the goods imported from the United Kingdom. The tariffs of 1914 and 1921 extended this preference to much of the remaining 40 per cent. Reciprocal preference to other British Dominions has been discussed with Canada, New Zealand, and South Africa, but without any important result. Since most of the Dominions export similar commodities, there is little trade between them; and Canada's desire for an Australian market for her motors, agricultural implements, and other machines is met by Australia's desire to make these things for herself.

The tariff imposed in 1920 (and approved by parliament in 1921) contained many interesting new features. During 1908-1913 the number of factory employees rose from 257,000 to 337,000, and the value of land, buildings, plant, and machinery from £53,000,000 to £74,000,000. By 1911 a large slice of some Australian markets had been won by the local producer; in terms of money value, two-thirds of the agricultural implements, seven-eighths of the leather, nine-tenths of the boots and shoes, three-quarters of the wearing apparel, a quarter of the woollen piece goods, two-thirds of the confectionery, eight-ninths of the furniture, and more than half the rubber goods, were made in Australian factories. During the war of 1914-18 many Australian industries enjoyed almost complete monopoly, for oversea commodities either could not be obtained, or were secured only at very high prices. New and big industries therefore came into being, especially those concerned with iron and steel, paints, the treatment of base metals, chemicals, engineering, shipbuilding, cement, motor bodies, etc.—about 300 new industries in all. Further, after the Armistice it became evident that many large English firms intended to acquire interests in Australia, and even erect factories in the Commonwealth. To protect the new industries and encourage British manufacturing capital to come to Australia, the tariff was raised, and new items (pig-iron, raw steel, etc.) were included. Some of the new duties were 'deferred;' that is, they were not to come into operation until factories had been set up which were capable of supplying some part of the continent's requirements. In consequence of trade depression some of these factories have not been established, and the duties are therefore still deferred.

The 1920 tariff was a 'three-decker,' with British, intermediate, and general rates on nearly every item. The British rate gave greater preference than was formerly accorded, and the intermediate rate was to be granted to those countries which were willing to make reciprocal preferential tariff arrangements with Australia. Further, a board was set up to assist in the administration of the tariff, and to advise the minister of trade and customs on such matters as the classification of goods, the need for new, increased, or reduced duties, the granting of bonuses, the measures to be taken against a manufacturer found using his protection to exploit consumers, and any other matters affecting the encouragement of primary and secondary industries. Under the industries preservation act of 1921 this tariff board was authorized to report, and the minister to act independently of parliament, in certain cases where the importation of goods was proving detrimental to an Australian industry; thus, when goods are being 'dumped' into Australia at a price below that demanded in the country of origin, or when they are offered cheaply because of a depreciated exchange, the minister has power to impose a heavy additional duty.

In 1925 the definition of 'British' goods was considerably narrowed. Since April 1925 preference has been granted only

(*a*) To goods which are wholly produced or wholly manufactured in the United Kingdom. [Manufactured goods will only be considered wholly manufactured in the United Kingdom if in the raw materials used, and also in finished goods, no manufacturing process has been performed outside the United Kingdom which is being commercially performed in the United Kingdom. The minister shall determine what are to be regarded as raw materials, and in such determination may include partially manufactured Australian materials.]

(*b*) To goods not wholly produced or wholly manufactured in the United Kingdom in the terms of paragraph (*a*), provided they contain at least 75 per cent of United Kingdom labour, and/or material in their factory or works cost.
(*c*) Notwithstanding anything contained in paragraph (*a*) or (*b*), to goods of a class or kind not commercially manufactured in Australia, provided they contain at least 25 per cent of United Kingdom labour and/or material in their factory or works cost.

The final process of manufacture must take place in the United Kingdom, and the goods must be consigned direct to Australia.

Since 1920 there has been a large increase in customs revenue, the yield from which now promises to hover round £20,000,000 per annum. The world-depression which began in 1920, along with the derangement of the European exchanges, rendered foreign competition very severe in the Australian market, and some Australian firms complained bitterly of their inability to meet the dumping of British and European goods. The tariff board was therefore busily engaged in considering applications from manufacturers for increased protection, and many dumping duties (some of them almost prohibitive) were imposed. These were aimed especially at goods from Germany and central Europe; but some wares from the United States, Britain, and other industrial countries have also been subjected to additional imposts. At the same time the board has heard applications for the free importation of machinery and other articles (chiefly raw materials), and has sometimes recommended that the tariff be waived on the ground that Australian industry cannot supply them. This new method of tariff-adjustment by administrative action is faced with great difficulties, and the board is naturally subjected to vigorous criticism from almost every quarter. The raw material of one industry is the finished product of another. Cement works ask for a remission of duty on cement-making machinery, but seek a 'dumping' duty on imported cement; hosiery-makers seek free importation of yarn, and higher duties on hosiery; yarn-makers protest against the first request, and hosiery-importers against the second. In the same way shipbuilders and railroad constructors clash with steel-producers, and builders plead for free entry of slates because of the predatory activities of the 'tile-making octopus.' To reconcile such opposing interests is a thankless and almost impossible task.

In 1924-5 the value of the output of Australian manufacturing industries was about £380,000,000, nearly three times the value of all imports. The two great classes of imports are (*a*) apparel, textiles, and manufactured fibres, (*b*) metals, metal manufactures, and machinery; these accounted for £46,000,000 out of £157,000,000 of imports in that year. Of the £42,000,000 imported in the first class, only £7,000,000 was apparel—so that, with the exception of hosiery and knitted goods, almost the whole of that market is now in the hands of local factories. £23,000,000 was spent on imported piece-goods—nearly half of it on cotton and linen fabrics, and one-fifth on woollens. Possibly the demand for woollens may yet be more fully met from local looms; but the absence of a big market makes it impossible for Australia to produce the variety of patterns which human vanity demands. In the second class, one quarter of the imports in 1924-5 consisted of motor vehicles and accessories; much of the rest is accounted for by specialized, patented products, but there was evidently still much scope for expansion in manufactures of iron and steel, and of such technically simple standardized things as rails, wire, and galvanized sheets.

A new tariff was proposed in 1925, and of course put into force at once. It was passed by the house of representatives, and is before the senate at the time (June 1926) this volume is going to press. It is based upon the recommendations of the tariff board, to which all applications for new, increased, or decreased duties are referred. The form of the 1920 tariff is preserved, and the preference on British goods has been maintained and even in some instances increased. On some items (silk piece-goods, carpets, clocks, and watches, for example) the duties are reduced, but on the whole the result is a considerable increase, for the imports affected by the duties which have been raised are very much more valuable than those on which they have been lowered. The chief increases are on textiles and apparel (notably cotton and woollen piece-goods), on metals and machinery, and on assembled and unassembled motor chassis. Some industries, of which iron and steel are the most important, have not yet been reported upon by the board.

Australian industrial expansion is limited by many serious factors. Except where production is in the hands of one or two factories—as in the case of steel, steel products, tobacco, etc. —the market is not large enough to allow manufacturers to profit fully by division of labour on a large scale. The market grows

slowly, and is local only, for the costs of production and transit are so high that very few manufacturers can look for an export trade. Money wages are higher than in competing European countries; in the United States, although the earnings of workers are higher, large-scale production makes labour-costs really lower. Fuel and power here are costly; freights are heavy for inter-State trade; construction-costs are sometimes burdensome. There is a lack of adequately skilled labour; there is, too, among employers a lack of appreciation of the value of efficient organization and industrial science. Further, heavy costs of production and the consequent high prices increase the working-costs of the rural community, and sometimes hamper primary producers in making ends meet when they receive world-parity prices. Finally, Australia relies on its export of primary products to discharge its monetary obligations abroad, and fares well or ill mainly in proportion to the prosperity or ill-success of the primary industries; any tariff policy, therefore, which injures primary production reacts harmfully on the manufacturing industries and on the progress of the whole country.

See Coghlan's *Labour and Industry in Australia* (1918), Allin's *History of the Tariff Relations of the Australian Colonies* (1918), Chomley's *Protection in Canada and Australia* (1904), Heaton's *Modern Economic History* (1921), Root's *Colonial Tariffs* (1906), David Syme's *Principles of an Industrial Science*, and Pratt's *Life of David Syme* (1908). The reports of the royal commission on the navigation bill (1904), of the tariff commission of 1904-7, and of the interstate commission on tariffs—as well as the annual reports of the bureau of commerce and industry and of the tariff board which was established in 1922—are worth careful study. For the long tariff campaign which preceded federation, and for a useful summary of tariff struggles from 1855 to 1880, see Quick and Garran's *Annotated Constitution of the Australian Commonwealth.*

H.He.

Taro, the popular (Polynesian) name of *Colocasia*, a genus of the family Araceae. *C. antiquorum* would seem to be the principal species, *C. esculenta, C. macrorrhiza,* and others being perhaps sub-species. The plant is cultivated in most tropical countries for its starchy root-stocks, which are naturally acrid but lose that defect if boiled, baked, or roasted; it is found throughout the tropics between Egypt and the Pacific islands, and is indigenous to the warmer parts of Queensland. *C. macrorrhiza* has proved hardy as far south as Melbourne. In Fiji the boiled roots of the tropical form are eaten cold, but Europeans usually prefer them hot. Many varieties are grown, some adapted for puddings, or bread, others for simply boiling or baking. A plant often called taro in extra-topical eastern Australia is really the cunjevoi (q.v.).

Tarwhine. See BREAM.

Tasman, ABEL JANZ. See AUSTRALIA, DISCOVERY OF.

Tasmania. When Anthony Van Diemen became governor-general of the Netherlands Indies in 1636 he set his heart on a thorough exploration of the Great South Land. The Dutch already knew a good deal about the northern and western coasts of Australia, and Nuyts had sailed along the southern coast as far as the head of the Bight. Van Diemen hoped that rich lands might be opened to trade in the south, or that a new route to South America might be discovered. He chose Abel Janszoon Tasman to command an expedition in two ships, the *Heemskerck* and *Zeehaen,* carrying 110 men in all. Tasman sailed from Batavia on 14 August 1642, but had to put into the Mauritius for extensive repairs. Leaving the Mauritius on 8 October, he sighted the west coast of Tasmania on 24 November 1642—a remarkably quick passage for those days. To the north-east he saw the mountains which Flinders later named Heemskirk and Zeehan. Tasman stood southward and then eastward along the coast and bore up for Adventure Bay, but a storm drove him to sea and he eventually cast anchor on 1 December in Marion Bay on the south-eastern coast. On 3 December the ship's carpenter, Jacobzoon, swam through the surf and planted the Dutch flag on the shore of a little cove on Forestier Peninsula, thus taking formal possession for Holland. A monument was erected at this spot in 1923. Tasman sailed next day, passing Maria Island and keeping along the coast as far as St. Patrick's Head. He then stood to the eastward and discovered New Zealand (see AUSTRALIA, DISCOVERY OF).

It was 130 years before Tasmania was again visited by Europeans. This time it was by a French expedition consisting of the ships *Mascarin* and *Castries* under Marion du Fresne, which had sailed from the Mauritius and on 4 March 1772 anchored in Marion Bay. Tasman's men had not seen the aboriginals, though they heard them and had seen their toe-holds cut in the trees. But when the French landed, a number of aborigines who had gathered near the beach made a small pile of firewood and offered Marion a torch. Thinking that they meant him to light the pile he did so; but on this they threw stones and spears at his party. Marion's men fired, and one native was killed and several were wounded. After a stay of six days Marion sailed for New Zealand, where he was slain by the Maoris.

In March 1773 Captain Tobias Furneaux, who accompanied Cook on his second voyage, entered Storm Bay in the *Adventure* and anchored in the bay to which the name of his ship has been given. Cook himself visited Adventure Bay in 1777 and Bligh touched there in the *Bounty* 11 years later. In 1789 Captain Cox, in the brig *Mercury,* sailed along the eastern and southern coasts and discovered Oyster Bay and Cox Bight. In 1792 the French navigators Bruni d'Entrecasteaux and Huon de Kermadec in the *Recherche* and *Espérance* spent a month in making surveys in the south-east, returning in the following year to complete them. They discovered the Derwent, which they called the Rivière du Nord; it owes its present name to Captain John Hayes (q.v.) who came from India to explore it in 1793.

For some years after the arrival of the First Fleet (q.v.) it was thought that Tasmania formed part of the Australian mainland, but in 1798 Bass and Flinders (see EXPLORATION BY SEA) circumnavigated the island. In 1802 it was visited by a second French expedition, under Nicholas Baudin, which busied itself chiefly with scientific work on the eastern coast. The activities of the French made Governor King highly suspicious; he warned Baudin off King Island and took the first opportunity of establishing a colony at the Derwent. The following announcement appeared in a government and general order of 29 March 1803:—'It being expedient to establish His Majesty's right to Van Diemen's Land, His Excellency has been pleased to direct Lieut. John Bowen of His Majesty's ship Glat-

ton, to form an establishment on that island.' King suggested Risdon Cove on the Derwent as a suitable place. Bowen (q.v.) took Jacob Mountgarret, surgeon of the *Glatton*, as medical officer, and Thomas Wilson as storekeeper. His military force consisted of one lance-corporal and seven privates of the New South Wales Corps, and there were 21 male and three female convicts. Three free settlers went with the party—Birt, who took his wife; Clark, a stonemason; and Smith, who was made overseer of convicts. Three women and one child accompanied the New South Wales Corps, and one woman and two children, exclusive of Mrs. Birt, accompanied the free settlers. Three other free persons, a man and two women (who were not victualled from the public stores), also went with Bowen. The colony thus consisted of 49 persons, of whom 13 were women or children. They took eight months' provisions and some live stock (10 head of cattle and 32 sheep); Bowen had the only horse, and the settlers brought 8 goats, 38 pigs, and some fowls. The expedition sailed on 31 August in the *Lady Nelson* and the whaler *Albion*. The *Lady Nelson* reached Risdon Cove on 7 September, and the *Albion*, with Bowen on board, arrived on Sunday 12 September. He named his 'capital' Hobart, which Collins subsequently lengthened to Hobart Town; the name was officially changed in 1881 to Hobart. The settlement did not thrive; the convicts were lazy and useless and the soldiers discontented. Seven convicts, led by John Duce, stole Bowen's whaleboat and escaped to the Bass Strait islands. After many adventures one of them, William Privet, shipped with an American sealer, Amasa Delano, and reached Chile. The arrival of 42 prisoners, 15 soldiers, an officer, and James Meehan, a surveyor, brought the population of Risdon up to over 100. Meehan, whose field-books are preserved in Hobart, examined the country about the Coal River, Pittwater, the Jordan, and the upper Derwent. But the 'establishment' made no progress. The store was broken into, a soldier was charged with the offence, and Bowen personally conducted him to Sydney—much to King's annoyance—leaving Lieutenant Moore in command.

In February 1804 Bowen returned from Sydney in the colonial cutter *Integrity*. She lost her rudder on the way and had to secure the help of the American sealer Delano, who convoyed her to the Derwent. Delano took with him from Hobart the approval of a good conscience—and an order on Governor King for £400, which was paid largely in wheat, sugar, and nails. Bowen found that he had been practically superseded by David Collins (q.v.), who had been sent from England in 1803 to form a settlement at Port Phillip but after a stay of a few months there decided to move to the Derwent; on 16 February 1804 he arrived with part of his expedition in the *Ocean* and the *Lady Nelson* and, on looking round, decided to make his headquarters at Sullivan's Cove, four miles below Risdon and on the opposite side of the river. Though Collins was now in command, the Risdon settlement lingered on for seven months, with Bowen as superintendent; when he left, most of his followers were sent back to Sydney.

Collins brought with him 358 men, 39 women, and 36 children, of whom 279 men and 2 women were convicts. The free settlers numbered 13 men and 7 women, with 16 children. John Pascoe Fawkner (q.v.) came with the expedition as a boy of 11, and the chaplain was Robert Knopwood (q.v.). Collins set his followers to clear away the trees and scrub from the banks of the Hobart Rivulet, and on 21 February 1804 he slept ashore in his tent. On the previous day he had set up his printing-press under a gum-tree and issued a general order fixing the weekly ration at 7 lb. of beef or 4 lb. of pork, 7 lb. of flour, and 6 oz. of sugar. He assigned land at Newtown to the free settlers. Like Phillip, Collins had to complain that the stores supplied, especially the tools, were mostly of very inferior quality; many of his convicts were men unused to labour. However, Tasmania's first government house was finished in three weeks. Wattle-and-daub huts were built to house the convicts, and 30 men were set to clear ground for wheat at the government farm, now Cornelian Bay cemetery. Port Phillip was completely evacuated, those who had remained behind arriving on 25 June 1804.

It was found that in the spring Storm Bay and the Derwent estuary swarmed with whales; Knopwood records in his diary that his boat was forced to keep close to the shore because whales were so thick in mid-channel and, looking from Sullivan's Cove, William Collins (the harbour-master) counted 50 at a time. Jorgen Jorgenson (q.v.) claims to have harpooned, in 1804, the first whale ever struck in the Derwent. William Collins worked out a plan for making Hobart Town a great whaling centre, and in 1806 established the first bay whaling-station at Ralph Bay (see WHALING AND SEALING). For a time the chief problem of the settlement was that of bare subsistence. Famine threatened it owing to the failure of crops in New South Wales and the lack of supplies from elsewhere. With rice doled out at the rate of 1½ lb. per head a week the community looked back hungrily to the ration-scale laid down in the first general order. Convicts were sent out to hunt kangaroos and emus, and the meat was sold at from 8d. to 1s. 6d. per lb. Some of these convicts became bushrangers, thus beginning an evil which long afflicted the colony.

While Collins and his men were fighting famine, another settlement was having its own troubles on the northern side of the island. On 15 October 1804 Lieutenant-colonel William Paterson (q.v.) sailed from Sydney with 67 soldiers, 74 convicts, and 40 free persons to found a settlement at Port Dalrymple. He was given jurisdiction over the part of Tasmania north of 42° south. H.M.S. *Buffalo* reached Outer Cove (Georgetown) on 11 November. Next day 80 natives came to the camp; they were given presents, but tried to steal everything they could lay hands on, then retired peacefully. Paterson explored the Tamar River up to the junction of the North and South Esk. He formed his settlement at York Town (afterwards called Yorkton), but in March 1806 moved the greater part of his establishment to the present site of Launceston (q.v.). As a result of the deposition of Bligh (q.v.) Paterson returned to Sydney in December 1808, and was succeeded by John Brabyn (q.v.) and Brabyn by Major George A. Gordon, during whose term occurred the strange tragi-comedy of Jonathan Hugo (q.v.). In 1812 the separate command in the north was abolished and Hobart became the capital of the whole island, though a small military establishment was kept, under 18 successive commandants, at Port Dalrymple till 1846.

Campania
Brighton
Richmond
Mt Bridgewater
Sorell
PIT WATER
Claremont
New Norfolk
Risdon
Lindisfarne
Cambridge
GLENORCHY
Bellerive
HOBART
Rokeby
FREDERICK HENRY BAY
SANDY BAY
Mt WELLINGTON
Fern Tree
BROWNS
Kingston
RALPH BAY
South Arm
Margate
Cape Direction
Scale of Miles
0 1 2 4 6 8 10
SISTERS
FLINDERS ISLAND
CAMERONS INLET
CAPE BARREN I
CLARKE I
THREE HUMMOCK I.
HUNTER ISLANDS
WALKER I.
North Pt
Circular Head
Stanley
Smithtown
Marrawah
West Pt
Trowutta
Myalla
Table Cape
Wynyard
Burnie
Blythe
Penguin
DEVONPORT
Preolenna
Ulverstone
Beaconsfield
Latrobe
Hampshire
Railton
Sheffield
Nietta
Guildford Jun
Waratah
Staverton
LAUNCESTON
Westbury
Mole Ck
Deloraine
Perth
Evandale
Longford
Cape Portland
Cape Naturaliste
ANDERSON BAY
Scottsdale
Derby
Tunnel
Mt ARTHUR
St Helens
Mathinna
BEN LOMOND
St Marys
Fingal
Avoca
Rosebery
Williamsford
Zeehan
ELDON RA
THE GREAT LAKE
LAKE ST CLAIR
LAKE ECHO
Campbell Town
Cape Lodi
Queenstown
Linda
Strahan
Cape Sorell
Pillinger
Woodbury
Oatlands
Bothwell
Parattah
Apsley
Colebrook
FLEURIEU OR OYSTER BAY
SCHOUTEN I
Cape Forestier
MARIA I
DERWENT
Brighton
Richmond
Sorell
Fitzgerald
New Norfolk
HOBART
Bellerive
EAST BAY NECK
JUNCTION RA
FRANKLAND RA
WELD
Rocky Pt
Huonville
Franklin
EAGLEHAWK NECK
TASMANS PENINSULA
IRON POT
STORM BAY
BRUNY
Port Arthur
Cape Pillar
TASMANS I
Cape Raoul
ARTHUR RA
PORT DAVEY
OLD R
SOUTH BRUNY
Fluted Cape
Tasman Head
Railways shown thus
South West Cape
South East Cape
Scale of Miles
0 5 10 20 30 40 50
SOUTHERN OCEAN
TASMAN SEA
H.E.C.R.
145
146
147
148
40
41
42
43

TASMANIA

Macquarie removed the northern headquarters to Georgetown in 1811, but it was soon shifted back to Launceston.

The most important event during Collins's administration was the removal of the Norfolk Island settlers to Tasmania. The British authorities had recommended this step in 1803, but the settlers were reluctant to go, and King was evidently antagonistic; but by October 1808 they were all transferred, mostly to the Derwent. This more than doubled the population of the Derwent settlement, and the newcomers were to be victualled for two years at the public cost, although Collins was already hard put to it to supply his own followers. Not till the *Venus* brought a cargo of wheat from India in 1810 was the fear of famine dispelled. Up to that time the settlement subsisted largely on kangaroo, and Edward Lord stated in evidence before a committee of the house of commons that he had often been glad to go to bed for want of bread. The Norfolk Islanders were given land at New Norfolk, Sandy Bay, Pittwater, and Clarence Plains in the south of the island and at Norfolk Plains in the north. Some of the best families in Tasmania are descended from them (see NORFOLK ISLAND).

In 1807 Lieutenant Thomas Laycock opened up communication between the settlements by making the first overland journey from Launceston to Hobart. Collins died suddenly on 24 March 1810, and Lieutenant Edward Lord, Captain John Murray, and Lieutenant-colonel Andrew Geils ruled in succession till the arrival of Colonel Thomas Davey (q.v.) as lieutenant-governor in 1813. During Davey's term of office the island was overrun by bushrangers, of whom Michael Howe (q.v.) was the most noted. They plundered Davey's own farm, and committed so many outrages that Davey placed the whole island under martial law, a step which Macquarie promptly vetoed. Yet with all its troubles the settlement made some progress under 'Mad Tom, the Governor.' In 1816 it sent 13,135 bushels of wheat to Sydney. In 1815-6 James Kelly (q.v.) discovered Port Davey and Macquarie Harbour, and opened up a trade in pine timber. Whaling and sealing also made progress. The colony's first newspaper, the *Derwent Star*, had been published in 1810, but it lasted a few months only. On 1 June 1816 Andrew Bent (q.v.) issued the *Hobart Town Gazette*, and the press was permanently established. On 19 February 1817 Davey laid the foundation-stone of St. David's, Tasmania's first church (see CHURCH OF ENGLAND).

Davey had fallen foul of Macquarie and was forced to resign. In April 1817 he was succeeded by Colonel William Sorell (q.v.). Under him the colony made good progress. There was an influx of free settlers, who were given grants of land; cattle and wheat were exported to the Mauritius, and wheat to Cape Town and Brazil, as well as to Sydney. The export of wool began, and bay whaling-stations were established at many points. In 1818 the road from Hobart to Launceston was completed and a weekly mail instituted. Up till 1819 all cases of any importance had to be sent to Sydney for trial, but in that year the supreme court sat in Tasmania for the first time, the judge (Barron Field) coming from Sydney. Schools were established, and religion received more attention. A Wesleyan minister, Benjamin Carvosso (q.v.), preached at Hobart in 1820, the first Roman Catholic priest, Philip Conolly (q.v.) arrived in 1821; the Presbyterians established their first church in 1823 (see PRESBYTERIAN CHURCH).

Yet with all its progress Sorell's term was very disturbed. In December 1821 a penal station for hardened offenders was established at Macquarie Harbour on the west coast, and its history is perhaps the grimmest episode of the 'system.' Dozens of convicts who sought to escape from it starved to death in the bush; others turned cannibal. In 1823 Alexander Pierce and five others tried to make their way through the wilderness to the settled districts, and preyed on one another till Pierce alone was left. Sent back to Macquarie Harbour, he escaped with another prisoner, ate his companion, and gave himself up, 'desiring rather to die than to live;' he made a full confession before being hanged at Hobart. Bushranging was suppressed for a time with the capture of Michael Howe. It revived, however, in 1824, with the escape from Macquarie Harbour of the gang led by Matthew Brady, who captured the township of Sorell and threatened to take Launceston. War also began with the aborigines. Murders and robberies were committed by the Oyster Bay tribe, led by the mainland aboriginal Musquito (q.v.), and the trouble ended only with the deportation of the natives (see TASMANIA, ABORIGINES OF).

To Sorell there succeeded in May 1824 the highly efficient but very unpopular Lieutenant-colonel George Arthur (q.v.), and with him came Judge Pedder (q.v.), bringing the charter of the Tasmanian supreme court. In 1825 Van Diemen's Land was proclaimed an independent colony, and a legislative council was formed. Governor Arthur reorganized the convict system, and divided the island into districts, each with its own magistrate and an efficient police staff. Bushranging was put down with a strong hand and the hangman had a busy time; in the first 15 months of Arthur's rule there were over 100 executions at Hobart. Macquarie Harbour was abandoned, and in 1833 a new penal station was formed on Tasman's Peninsula. The north-west of the island was opened up by the Van Diemen's Land Company (q.v.). Arthur's nephew was a member of the association which sent John Batman (q.v.) to Port Phillip, and Arthur suggested, without effect, that the Port Phillip district might be added to Tasmania, from which its pioneers came. During his term of office the number of government schools was raised from 2 to 29, and the colony had become very prosperous when in 1837 he was succeeded by Sir John Franklin (q.v.). A marked feature of Sir John's term was the help given to science and art by the governor and Lady Franklin. The Royal Society of Tasmania (see SOCIETIES, LEARNED) was established, and Tasmania became for a time the intellectual centre of Australia. Lady Franklin built near Hobart a beautiful little museum, which was afterwards used for storing apples.

With the cessation of transportation to New South Wales in 1840 convicts were poured into Tasmania at the rate of 4000 a year, a fact which led to trouble in the days of Franklin's successor, Sir John Eardley-Wilmot (q.v.). By 1853, when transportation to Tasmania ceased, the total number of convicts sent there had risen to 67,655, or more than half as many as were sent to the mainland between 1788 and 1868. The country was flooded with unemployed prisoners, and bushranging revived, though not

on so great a scale as in the days of Howe and Brady. Land sales fell off, the cost of the police establishment grew, and when the governor tried to increase taxation he came into conflict with members of the legislative council who questioned his right to exercise both a deliberative and a casting vote. Eventually the 'patriotic six'—Dry, Gregson, Fenton, Kermode, Kerr, and Swanston—resigned; when Sir William Denison (q.v.) became governor in January 1847 after a brief interregnum, he reinstated them. Though Denison reported against any sudden cessation of transportation the movement against it gained strength. John West (q.v.) organized the Anti-transportation League, and in 1851 the 'League and Solemn Engagement of the Australian Colonies' was adopted at a conference in Melbourne. Transportation to Tasmania finally ceased in 1853. In the meantime the rush to the Victorian gold-diggings had drawn a large proportion of Tasmania's adult male population across the strait, and great numbers of ex-convicts contrived to make their way over. However, the diggings brought about a great demand, at boom prices, for Tasmanian timber, grain, potatoes, and other products. In 1855 the value of the exports was £1,756,000, or three times what it was when the gold-rush began.

With the cessation of transportation in 1853 the old name of Van Diemen's Land was officially changed to Tasmania. The penal settlement at Port Arthur (Tasman's Peninsula) continued to exist till 1870, but during the last few years of its existence it was rather a benevolent institution than a place of punishment. Tasmania's first parliament under responsible government was called together on 2 December 1856. The extravagance of the golden age had led to embarrassment, and parliament soon had to face a deficit of £80,000; this was met by issuing debentures, thus laying the foundation of the public debt. In 1858 a waste lands act was passed which helped in the opening up of the north-west coast, now the chief agricultural district of the island. In 1863 the last of the imperial troops stationed in Tasmania were transferred to New Zealand. In 1867 was passed an immigration act by which land-orders were given to all persons paying their own passages from Europe. To each migrant over 15 land to the value of £18 was allotted, and for each child between the ages of 12 months and 15 years was allowed land to the value of £9. Special provision was made for Europeans from India; 50,000 acres were set aside for them at Castra on the north-west coast, and a scheme was initiated by Lieutenant-colonel Crawford for the benefit of retired Indian officers.

The first sod of the Launceston and Western railway was turned in 1868. It was built under a guarantee system by which the landholders of the districts served were to make good any loss on the working expenses. This system broke down, and is best remembered by the case of 'Griffin's horse,' an animal seized for the non-payment of railway rates. In 1870 the population reached the 100,000 mark, and the franchise was lowered. Nevertheless the colony was in a very depressed state; imports had sunk to £750,000 and exports to £650,000. Wool was one of the main exports, but the spread of scab among the flocks seriously threatened the industry. The scab act was passed in 1870 by James Whyte, and by March 1881 scab had entirely disappeared and has never returned. In 1871 'Philosopher' Smith (see SMITH, JAMES) found tin at Mount Bischoff. Tasmania became more prosperous during the seventies; roads were built, and in 1876 the railway from Hobart to Launceston was opened. In 1875 rich deposits of tin were found at Mount Cameron, Thomas's Plains, and elsewhere in the north-east, and in 1877 the Dalley brothers found the Tasmania gold-mine at Brandy Creek, now Beaconsfield, which yielded gold to the value of over £3,000,000 before it closed. With the early eighties came a 'boom and borrow' period; there was much reckless speculation in mines, and a large public works expenditure—some of the railways built at that time are still a millstone round the neck of the Tasmanian railways department. At the end of 1887 the public debt was £4,109,370, or £28 16s. 10d. a head, a great sum for those days. The year 1888 saw the export of fruit to Great Britain, first attempted in 1884, put on a permanent footing. The discoveries of copper, silver, and gold attracted a considerable mining population to the inhospitable west coast, which had been deserted, except by a few pine-cutters, after the withdrawal of the Macquarie Harbour settlement. The year 1889 saw the establishment of a university, which had been projected in the days of Franklin. The bursting of the land boom in Victoria in 1891 had its effect in Tasmania, where there was a heavy slump in the west coast silver shares, and the financial crisis led to the failure of the Bank of Van Diemen's Land, thereby causing widespread misery. The financial collapse and the cessation of public works threw many men out of employment; higher taxation was imposed and the salaries of civil servants were lowered, but the progress of agriculture and of mining restored prosperity. In the late nineties the Mount Lyell mine, which was opened as a gold-mine in 1883, came to the front as one of the world's richest copper-mines. It has produced metal to the value of nearly £15,000,000, has paid over £3,000,000 in dividends, and is still the mainstay of Queenstown. In 1896 Tasmania provided the headquarters for Tattersall's 'consultations,' and in spite of all the objections raised from time to time against the continuance of this lottery the State has never been able to do without the revenue which it yields. At the elections of 1897 Tasmania was the pioneer of proportional representation, with the Hare-Clark system of voting (see PARLIAMENTARY ELECTIONS). In the following year she, by a large majority, declared in favour of the federal constitution bill, a decision which not a few of her citizens have since regretted. Federation in 1901 seriously affected the finances of Tasmania. In 1900 the island had raised £490,000 in customs duties; with federation the duties on goods from the mainland States ceased, and the control of customs passed to the Commonwealth. To make good the deficiency, the State imposed heavier direct taxation, raising the amount per head from 11s. 9d. in 1900 to over three times that in 1925.

Under interstate freetrade the competition of mainland factories in many cases proved too strong for Tasmanian factories. Later the development of Tasmania's water-power (see HYDRO-ELECTRIC DEVELOPMENTS) led to the establishment of important industries, especially the Electrolytic Zinc Company's works. Nevertheless the emigration from the island continued, and made the growth of population very slow in spite of the high natural rate of increase by the excess of births over deaths. As far back as 1826 a Hobart newspaper complained

of the emigration of artisans and mechanics to Rio de Janeiro and Valparaiso, and ever since the settlement of Port Phillip there has been a steady flow of population to the mainland and to New Zealand. At the census of 1921 Tasmania returned a population of 213,780, with the numbers almost stationary; yet with an area of 26,215 square miles this made her, with the exception of Victoria, the most densely populated State of the Commonwealth. Nor were the people concentrated in the capital to anything like the same extent as in the other States, for Hobart (q.v.) contained only a quarter of the total population; nevertheless one-fourth of the island, in the south and south-west, did not contain a single permanent inhabitant. See TASMANIA, CLAIM ON THE COMMONWEALTH.

See Evans's *History and Present State of Van Diemen's Land* (London, 1824); Backhouse's *Narrative of a Visit to the Australian Colonies* (London, 1843); West's *History of Tasmania*, 2 vols. (Launceston, 1852); Fenton's *History of Tasmania* (Hobart, 1884); Walker's *Early Tasmania* (Hobart, 1902); the *Handbook of Tasmania* (Hobart, 1914); and Ida Lee's *Early Explorers in Australia* (London, 1925).

T.D.

Tasmania, ABORIGINES OF. When Tasmania was discovered it was inhabited by one of the most primitive races that have survived till modern times. It had apparently inhabited the island from a very remote period, and was still in the pålaeolithic stage of development. (Sir Edgeworth David is of opinion that a stone implement found in a tin-drift near Gladstone dates back 30,000 years or so.) It has been conjectured that the Tasmanians entered the island while it was still joined to Australia, and this would indicate that people of the same type once inhabited the mainland. Yet the Tasmanian aboriginal is not of the same race as the Australian blackfellow. Whereas the natives of the mainland, who have been described as 'black Caucasians,' have long straight coarse hair, the Tasmanian's hair was short and curly or woolly, somewhat like that of the negro, and his skin was, if anything, darker. From the few records of their language that have been preserved it does not appear that it had any affinity to that of the mainland tribes; their culture was certainly of a lower type. The boomerang and the wommera, or spear-thrower, of the Australians were unknown to them (an ignorance shared curiously enough by the aborigines of Melville Island off the northern coast of Australia). They used only the crudest of chipped stone implements, with no attempt at handles; their weapons were hardwood waddies or clubs and their spears simply throwing-sticks with points sharpened and hardened by fire. They had no sea going canoes, but sometimes made a rude craft for crossing streams by binding together strips of bark. Their favourite hunting-grounds were the lightly-timbered lands near the sea, where game was plentiful and where the shellfish which formed a large part of their diet could be obtained. Huge kitchen-middens are found along the eastern coast; but even on the inhospitable southern and western coasts there were small tribes which must have lived mainly on shellfish. Though the winter climate of Tasmania is severe, it seems doubtful whether in their primitive state they ever wore clothing of any kind. Their number has been variously estimated, but when the English arrived it probably did not exceed 2000. They spoke a number of dialects, and the natives of the eastern coast could not understand those from the north and north-west.

Unfortunately few of the white men who knew them in their primitive state have left any record of their observations, and in any case those who knew them best were ignorant, often illiterate. A hunter named Germain lived with them for some years in the early days and he and others described them as a simple and kindly people till they were driven to desperation by ill-treatment. Some of the French scientists spoke very highly of them, but their opportunities for observation had been limited. Thomas Dove, the chaplain to the aboriginal settlement at Flinders Island, summed them up as follows:—

> The aborigines have usually been regarded as exhibiting the human character in its lowest stage of degradation; but if we look, however, to the methods which they devised of procuring shelter and subsistence in their native wilds, to the skill and precision with which they tracked the mazes of the bush, and to the force of invention and memory which is displayed in the copious vocabulary of their several languages, they claim no inconsiderable share of mental power and activity.

The first meeting between white and black was ominous. It occurred in 1772, when Marion du Fresne visited Tasmania. The aborigines threw stones and spears and the French replied with musket-shots which killed one and wounded others. The next clash came at Risdon on 3 May 1804. A party estimated at 300 men women and children appeared on the hills above the settlement. It was a hunting-party driving kangaroos into the valley, and the fact that they had women and children with them shows that they had no intention of attacking the whites. Lieutenant Moore, the officer in charge in Bowen's absence, lost his head and ordered the soldiers to fire, with the result that a number were killed. Bowen's surgeon sent a note to chaplain Knopwood at the Hobart settlement asking him to come over and christen a child whose father and mother had been killed, and inviting Colonel Collins's surgeon to come and dissect the body of one of the slain.

Later the aborigines suffered from the shocking brutality of the bushrangers and of the lower type of convict stockmen, and on the north-eastern coast their women were stolen by sealers, who took them as far afield as Western Australia; yet until 1820 they made little attempt at retaliation. Their first leader against the whites was Musquito (q.v.), a New South Wales black, who made himself chief of the Oyster Bay tribe and murdered several settlers and stockmen. He was eventually hanged, but the relations between the two races grew worse and murders by the aborigines became more and more frequent. As rewards offered for their capture had little effect, Governor Arthur resolved in September 1830 on a great 'drive' with the object of capturing the Oyster Bay and Big River tribes, who were the settlers' worst enemies. More than 3000 men took part and marched down the eastern side of the island with the intention of driving the tribes on to East Bay Neck. This 'Black Line' lasted seven weeks and cost £35,000; but when the net was drawn there was nothing in it; one woman and a boy had been caught asleep under a log on the way down. It was after this failure that G. A. Robinson (q.v.) was allowed to try conciliation. By 1835 he had brought in 187, who with a few brought in by roving parties formed the remnant of the race. It was supposed that

there were none left in the bush, but in 1842 a family of seven, a man, a woman, and five children were brought in by sealers who had found them near Cape Grim. These seven were the last of their race in a wild state.

The aborigines were placed on Flinders Island in Bass Strait, and Robinson, who was in charge of them for a time, reported with great enthusiasm on their progress in civilization. The only drawback, he said, was the excessive mortality. They solved the problem by dying off as fast as they could, and in 1847 there were only 45 left. These were then removed to Oyster Cove near Hobart, where the process of extinction was furthered by drink and association with the worst type of white man. In March 1869 William Lanne, the last full-blood male, died in Hobart hospital; he had been a whaler, and when he was paid off went on a drinking-bout which ended in his death. Trucanini (q.v.), usually regarded as the last of the race, died on 8 May 1876. She is said to have been born in 1803, the year in which white settlement began. Her dying request was 'Bury me behind the mountains;' but her skeleton is in the Hobart museum. It is possible that Mrs. Seymour who died at Kangaroo Island, South Australia, in 1909 at a great age was a full-blood Tasmanian; it is said that she was stolen when a child and taken there by the sealers. The so-called half-castes of Cape Barren Island, Bass Strait, are descended from the offspring of sealers and native women, but they are of mixed and intricate ancestry, since the sealers obtained women from various parts of Australia as well as from Tasmania. They now number over 300, exclusive of those who have left the island. T.D.

See *Correspondence on the subject of Military Operations against the Aborigines* (London, 1831); Bonwick's *Daily Life and Origin of the Tasmanians* (London, 1870); *The Last of the Tasmanians* (London, 1870); *The Lost Tasmanian Race* (London, 1884); and Davis's *Osteology and Peculiarities of the Tasmanians* (Haarlem, 1874).

Tasmania, CLAIM ON THE COMMONWEALTH. When Tasmania entered the Commonwealth in 1901 its finances had recovered from the depression of the early nineties (see TASMANIA), and the revenue showed a surplus over expenditure. As a result of somewhat heavy State customs duties there had grown up a number of local industries, many of which were unable to compete with the larger mainland factories when federation brought about interstate freetrade. Later on Tasmania was badly hit by the Commonwealth Navigation Act, which prevented overseas vessels from carrying goods and passengers from and to the mainland ports. The position was also aggravated by strikes, which year after year cut off communication with the mainland at the most important season. There has, moreover, been a steady efflux of population to the mainland states; between 1901 and 1925 Tasmania lost 38,000 persons (which is more than a fifth of what her population was in 1901) by the excess of emigration over immigration, and those who went were usually the young and vigorous.

In 1910 a royal commission enquired into the complaint that the system of book-keeping adopted by the customs authorities was greatly to Tasmania's disadvantage. Under federation a large proportion of the overseas goods consumed in Tasmania paid duty in Melbourne or Sydney, at which ports they were landed for transhipment. As a result of this enquiry a sum of £500,000, spread over the 10 years beginning with 1913, was paid to Tasmania. The financial position, however, went from bad to worse. In 1924-5 the Commonwealth decided upon making an annual grant to Tasmania. It was to begin with £85,000 and to diminish every year by £17,000 (i.e. it was to become £68,000 in the second year, £51,000 in the third, and so on) till it should cease in 1928-9.

But the accumulated deficit, which was £858,607 in 1923-4, kept on increasing, until in 1926 it was officially stated that, combined with various liabilities which had to be met, it amounted to £1,660,000, despite the fact that taxation had been increased until Tasmania had the highest direct taxation in the Commonwealth. In 1926 Sir Nicholas Lockyer was appointed to enquire into Tasmania's claim for assistance.

In June 1926 the Commonwealth ministry brought forward a States grant bill which provided that Tasmania should be granted £378,000 a year for two years. At the end of that period the position was to be reviewed. In addition, the measure proposed to give her £136,000 a year as an 'adjusting grant' to compensate for the abolition of the Commonwealth's per capita payment. Together, the two grants make a total of £514,000 a year. T.D.

Tasmanian Devil, a species (*Sarcophilus harrisi*) of the family Dasyuridae of polyprotodont marsupials. Like its ally the Tasmanian wolf (q.v.), it is now found exclusively in Tasmania; but *Sarcophilus* was represented on the mainland of Australia at a comparatively re-

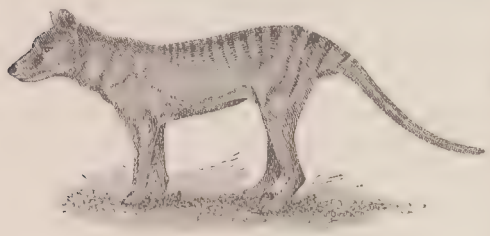
Sarcophilus harrisi.

cent geological date, for remains have been found in the Wellington caves (see LIMESTONE CAVES) and in deposits of Pleistocene age in Queensland and Victoria. Its arrival in Tasmania must have taken place when that country was still a peninsula, and the survival there, while it perished on the mainland, may have been due to the fact that Tasmania was completely isolated before the dingo could enter and extirpate the two carnivorous marsupials. The devil is much smaller than the wolf, the head and body being only about 28 inches in length, and the tail about 12 inches. In general shape it is more like a native cat than a wolf, but is much thicker and broader than the former, with relatively shorter limbs. The muzzle is short and broad, the eyes small, the ears broad and rounded. The limbs are plantigrade (the weight resting on the soles) as in native cats, not digitigrade (the weight resting on the lower surfaces of the digits) as in the wolf. The toes are sub-equal, with strong curved claws; the first toe of the hind-foot is absent. The tail is relatively short, thick at the base, narrow in the rest of its extent, and thickly and uniformly covered with hair. The thick, close fur of the

head and body is black or blackish-brown throughout, except for a variable number of white patches, of which the only constant one is a half-ring on the front of the chest. Under the body-fur there is frequently found a thick coating of lice that at first sight resembles a coat of scales; trapped specimens are therefore handled very gingerly. Its vernacular name is due to its implacable ferocity, which no treatment serves to tame. It frequently attacks and kills sheep, and, when it can gain access to fowl-runs, works wholesale destruction. By trapping and other means its numbers have been greatly reduced, and it is now almost exterminated, save in unsettled and comparatively inaccessible districts. Like the wolf it is nocturnal, and shows in captivity a shrinking sensitiveness to bright light. Like the wolf, too, and certain native cats, it is in the habit of searching the sea-beach for dead fish or other animals cast ashore. See MARSUPIALS. W.A.H.

Tasmanian Society, THE. See SOCIETIES, LEARNED.

Tasmanian Wolf, sometimes called Tasmanian tiger or thylacine (*Thylacinus cynocephalus*), is the largest member of the Dasyuridae, a family of polyprotodont marsupials. Confined at the present day to certain of the less



Tasmanian Wolf.

accessible parts of Tasmania, and verging on extinction, the thylacine with its ally the Tasmanian devil (q.v.) was, at a period not very remote, abundant on the mainland; from this habitat it may have been driven by the advent of the dingo before Tasmania, by the formation of Bass Strait, became definitely converted from a peninsula to an island. The surviving Tasmanian thylacine superficially resembles a dog or a wolf in the general shape of the body, head (with its erect ears), limbs, and tail. The head and body together measure about 44 inches, the tail about 21 inches. The fur is short, close, and rather harsh, of a general gray-brown colour with a faint yellowish or tawny tinge. The back, in the region behind the shoulders, is marked with a number of transverse blackish-brown bands. The head is remarkably dog-like, but the eyes are rather larger than those of dogs and the mouth-opening extends farther back. The tail is shorter than the trunk, thick at the base, and scantily furred. The limbs resemble those of a mastiff or a collie, but are shorter in proportion to the size of the body. They correspond with those of the dog, and differ from those of native cats, in being digitigrade—i.e. the lower surfaces of the digits, not the palms or soles, rest on the ground. The toes are sub-equal, with short, thick claws; the first toe of the hind-foot is entirely wanting. The skull much resembles that of a mastiff, but the teeth are strikingly different (for example, there are four incisors on either side of the upper jaw), and in the bones of the skull itself there are radical anatomical differences. The 'marsupial' or epipubic bones of the skeleton, so general in marsupials, are in the thylacine represented by cartilage only. The pouch of the female opens backwards, and has four teats The thylacine is nocturnal, lying concealed during the day in caves or natural hollows among rocks, or in holes dug out by itself. If living by the shore, it feeds largely on animals of many kinds cast up on the beach; but it hunts and preys on any smaller mammals that come within its range, even the spiny anteater (*Tachyglossus*). It is a formidable enemy of poultry keepers and sheep-farmers, and is ruthlessly destroyed when captured by pitfalls, traps, or packs of dogs. When attacked by dogs it will often defend itself with courage and determination. See MARSUPIALS. W.A.H.

Tate, RALPH (1840-1901), born at Alnwick in Northumberland in March 1840, was the son of Thomas Tate the astronomer, mathematician, and inventor of the double-piston air-pump, and nephew of George Tate the geologist and archaeologist—both distinguished enough to find a place in the *Dictionary of National Biography*. The boy, after studying mathematics with his father and geology with his uncle, obtained in 1858 a government exhibition at the London school of mines; subsequently he taught at the London polytechnic and at mining schools in Bristol and Ireland, and in 1864 became fellow and lecturer of the Geological Society of London and curator of its museum. From 1867 onwards he visited Central America, Guiana, and the United States as a mining expert, also working as a geological surveyor in northern England and conducting classes for the miners of the Durham-Yorkshire coal and iron mines. In 1874 the Geological Society allotted him the Murchison fund. In 1875 he received the first appointment to the Elder chair of science in the university of Adelaide, which he held till his death. In 1882 he accompanied a parliamentary party to the Northern Territory, and furnished reports on the mineralogy (and to some extent the botany) of the interior. He was one of the founders of the Adelaide Philosophical Society, and the first president of the Royal Society of South Australia; when the Australasian Association for the Advancement of Science was inaugurated in Sydney in 1888, he was appointed president of the biological section, and in September 1893 was president of the Adelaide meeting. In 1894 he accompanied the Horn expedition to central Australia as geologist. For 40 years he was a recognized authority on botany, geology, mineralogy, and conchology, and a prolific contributor to the scientific journals of Europe, America, and Australia. In 1890 he published a *Handbook of the Flora of Extratropical South Australia*. He was a fellow of the Linnean Society of London, a member of the Linnean and Royal societies of New South Wales, of the Royal and Microscopical Societies of Victoria, and of the Field Naturalists' clubs of Melbourne and South Australia. He died at North Adelaide on 20 September 1901.

Tawell, JOHN (1784-1845), born of a Quaker family in 1784 at Aldeby in Norfolk, England, in 1804 went to London and worked for a linendraper, and next became traveller for a chemist and druggist at Uxbridge. In 1814 he was arrested for having forged a bill on the Uxbridge bank; he could have been hanged for forgery, but the bank officials, being Quakers also

and opposed to capital punishment, prosecuted him on the minor charge of having the bill in his possession, and on that charge he was sentenced to transportation. Arriving in Sydney, his knowledge of chemistry gained him employment in the convict hospital. By assiduity and good conduct he soon gained a ticket of leave, and then freedom, from Macquarie, started as a chemist and druggist (with groceries as a side-line) in Hunter-street, Sydney, and later moved to larger premises in Pitt-street; he also purchased a whaling-ship, 'cornered' the whalebone market, speculated in oil, and became wealthy. His respectability at this time was unquestioned. He built a chapel for the Society of Friends in Macquarie-street (which was opened on 1 November 1835) and on 5 March 1836, to prove his sincerity, caused 492 gallons of rum and 116 gallons of Geneva gin to be taken from Campbell's bonded stores and poured into the harbour in the presence of many members of the local temperance society. About 1840 he returned to England, where his wife fell ill; he contracted a liaison with her nurse, but when the wife died married again, and—since the financial crisis of 1843 impoverished him beyond the possibility of keeping up two homes—determined to murder the nurse. After several failures with morphia, on 1 January 1845 he succeeded in poisoning her with prussic acid in a cottage near Windsor, left the body there, caught the train to London at Slough, and thought himself safe. But on the Slough-London line the electric telegraph, then a novelty, had been installed. The murder was discovered almost immediately, and persons who had noticed his hurried departure sent a message to the London police that ensured his being tracked from the station to his lodgings and arrested there. This was probably the first occasion on which the telegraph was used to hunt down a criminal. Tawell confessed his guilt, and was executed at Aylesbury on 21 March 1845.

His Australian estate, forfeited to the crown as that of a felon, was as an act of grace reconveyed to his widow. Between the execution and the arrival of the news in Sydney part of it had been sold to a Sydney man, and the reconveyance from the crown prevailed against the innocent purchaser. Charles Cowper, then premier of the colony, refused to acquiesce in this injustice; when Denison, the governor, demanded the great seal to complete the official grant, Cowper sent it and his resignation with it. The matter was brought up in parliament, and Denison's conduct was severely attacked, but by that time he had left the colony and the affair was dropped.

Taxation. In Australia there are at present three distinct taxing authorities or groups of authorities, (*a*) the Commonwealth government; (*b*) the State governments; and (*c*) local governing bodies. The authority of the Commonwealth government is based upon section 51 (ii) of the constitution, where provision is made that the federal parliament shall have power to make laws with respect to taxation, 'but so as not to discriminate between States or parts of States.' To the State governments unrestricted powers of taxation were accorded under their several constitutions, but these powers are now limited by provisions of the federal constitution that transfer the departments of customs and excise to the Commonwealth and make the imposition of duties of customs and excise an exclusive function of the federal parliament. Local governing bodies derive their authority mainly from the State acts creating them, but also to a minor extent from various special acts of the State legislatures. They are, consequently, strictly limited as regards the field of taxation open to them.

It is usual to make a distinction between 'direct' and 'indirect' taxation; the line between the two classes is, however, not clearly drawn, and prominent authorities differ as to the definition of the terms. Thus Mill defines indirect taxation as that which is demanded from one person in the expectation and intention that he will indemnify himself at the expense of another; Bastable says that practical financiers regard those taxes as direct which are levied on permanent and recurring occasions, and as indirect those made on occasional and particular events. Under both definitions income tax is direct and customs and excise duties are indirect; but, whereas under the former definition probate duties are direct taxes, under the latter they are indirect. In Australia it is usual to regard customs and excise duties and licence fees as indirect taxation, and practically all other forms as direct taxation—thus according approximately with Mill's definition.

The collection of duties of customs and excise became a function of the federal government from the inauguration of the Commonwealth. For some years thereafter opinions were divided as to whether, in view of the nature and circumstances of the federation, the federal government would be morally justified in imposing land, income, and other taxes, except in an emergency. The States, many publicists thought, having forgone all right to impose duties of customs and excise, should, except in case of national peril, be left in undisputed possession of other fields of taxation. In 1906, under the excise tariff act of that year, a duty was imposed by the Commonwealth legislature on locally manufactured agricultural implements, not to be applicable to those manufactured under certain wages conditions. This act was declared invalid by a majority of the high court, on the ground that it was in fact an act to regulate the manufacture of agricultural implements, and that the imposition of a 'tax' was a mere incident to its substantive purpose.

The next essay in Commonwealth taxation was the land tax act of 1910, which gave the Commonwealth government power to levy a tax upon the unimproved value of all lands in Australia not specially exempted. Under this act two classes of taxpayers were provided for, resident and absentee. For the former class there was a basic exemption of £5000 unimproved value in respect of each taxpayer; in the latter the whole unimproved value was subject to taxation. The rate of tax in both cases was fixed on a sliding scale so adjusted that each additional £ in the unimproved value involved a slightly higher rate of tax per £ of the whole taxable value. This method of continuous increase in rate has been described as a 'ramp-like' progression, in contradistinction to the step-progression usually employed. In 1914 the rate of taxation of unimproved land values was considerably increased, and an act was passed imposing a tax on the estates of deceased persons.

In 1915 a federal income tax was imposed, in 1916 an entertainments tax, in 1917 a war-time profits tax (which was only collected on profits until 30 June 1919), and in 1918 a war postage tax (½d. on each letter); this last tax ceased on 1 October 1920. Each year of the

war was thus marked by the introduction of a new form of federal taxation. In addition, the income-tax rate originally applied in 1914 was supplemented during the period by an addition of 25 per cent in 1916-17 and 1917-18, and in 1918-19 and 1919-20 by a super-tax of 30 per cent on the original tax plus the additional tax. An additional super-tax of 5 per cent was paid during 1920-1 and 1921-2, but a reduction of 10 per cent was in force during 1922-3. A further reduction of 10 per cent in 1924-5 brought the excess over the original rates down to 38 per cent. A reduction of 12½ per cent was announced in September 1925.

The total taxation collected by the Commonwealth government during the financial years 1920-25 is as follows:—

Form of taxation.	1920–1.	1921–2.	1922–3.	1923–4.	1924–5.
	£	£	£	£	£
Customs duties	21,731,210	17,328,310	22,597,306	25,177,882	26,405,161
Excise duties	10,078,696	10,302,049	10,274,823	10,572,902	10,787,620
Land tax	2,155,699	2,284,040	2,018,876	2,030,127	2,519,711
Estate duty	1,179,513	991,378	1,172,935	1,320,911	1,381,051
Income tax	14,351,408	16,790,682	12,904,518	11,057,555	11,136,344
Entertainments tax ...	649,828	675,075	629,802	622,460	680,586
Wartime profits tax ...	2,083,139	1,306,708	286,757	70,646	*Dr.* 74,783
War postage	197,928	.....	.....	.....	.....
Total Commonwealth taxation	52,427,421	49,678,842	49,885,017	50,852,483	52,835,690
Commonwealth taxation per head of population	£ s. d. 9 13 9	£ s. d. 9 0 4	£ s. d. 8 17 1	£ s. d. 8 16 11	£ s. d. 8 19 11

Customs and excise duties were from the earliest dates the stand-by of colonial governments, and the transfer of these sources of revenue to the Commonwealth imposed a severe strain on the financial arrangements of the States, which was partially remedied for the first ten years of federation by the return to the States during that term of not less than three-fourths of the net revenue from duties of customs and excise (see BRADDON CLAUSE). For the last complete financial year preceding federation (that ending on 30 June 1900) the total revenue of all the colonies from customs and excise duties was £7,672,239, and the total from all other forms of taxation £2,590,507. Thus revenue from customs and excise represented at the time almost exactly 75 per cent of the total taxation revenue. The other important forms of taxation were land tax, income tax, dividend tax, probate duties, stamp duties, and licence-fees. Probate duties and licence-fees had been collected for many years, the other forms of taxation being added gradually with the growth of the financial needs. At present the forms of taxation in force in the States are as follows: stamp duties, land tax, income tax, probate duties, licence-fees, and taxes on horse-racing in all States, motor-car taxes in South Australia and Tasmania, and an amusement tax in Tasmania. The dividend taxes of Queensland and Western Australia are really special income taxes, levied at the source on dividends earned in each State.

The revenue from taxation of the States for the year ending on 30 June 1925 was as follows:—

Taxation.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	All States.
	£	£	£	£	£	£	£
Land tax	2,569	421,662	452,481	186,605	113,865	124,114	1,301,296
Income and dividend tax	4,661,892	2,076,656	2,509,913	1,267,974	716,110	781,194	12,013,739
Probate duties	1,240,886	802,333	751,340	225,999	68,115	88,404	6,735,766
Stamp duties	1,485,842	1,242,919		442,823	204,109	182,996	
Licence fees	223,237	381,115	100,232	54,971	68,926	22,888	851,369
All other taxation	500,725	22,708	100,194	112,383	52,907	106,764	895,681
Total State taxation	8,115,151	4,947,393	3,914,160	2,290,755	1,224,032	1,306,360	21,797,851
State taxation per head of population ...	£ s. d. 3 12 0	£ s. d. 2 19 9	£ s. d. 4 13 9	£ s. d. 4 5 1	£ s. d. 3 7 3	£ s. d. 5 19 11	£ s. d. 3 14 4

The heading 'All other taxation' includes taxes on horse-racing (£803,273), motor-car taxes (£141,617), and amusement tax (£19,224). The motor-car taxes are distinct from motor-car licences, the proceeds from which are included under the heading of licence-fees. For the financial years 1920-1925 the total State revenues from the different forms of taxation are shown in the following table. The most productive tax is the income tax, imposed in all the States, stamp duties occupying second place. The dividend tax is levied in Western Australia.

Form of taxation.	Total State taxation.				
	1920–1.	1921–2.	1922–3.	1923–4.	1924–5.
	£	£	£	£	£
Land tax	1,118,544	1,156,752	1,187,471	1,237,027	1,301,296
Income and dividend tax	10,180,024	9,543,421	9,667,762	10,420,760	12,013,739
Probate duties	2,018,945	2,244,959	2,439,389	2,374,079	6,735,766
Stamp duties	3,373,838	3,241,001	3,663,947	3,928,328	
Licence fees	669,727	731,953	794,420	954,497	851,369
All other taxation ...	842,573	929,834	981,569	1,110,437	895,681
Total State taxation ...	18,203,646	17,847,923	18,739,558	20,025,138	21,797,851
State taxation per head of population ...	£ s. d. 3 7 3	£ s. d. 3 4 9	£ s. d. 3 6 6	£ s. d. 3 9 8	£ s. d. 3 14 4

The total State taxation derived from all sources in each of the States for the five years are given in following table. The most marked increase occurs in the case of New South Wales.

State.	Total State taxation.				
	1920–1.	1921–2.	1922–3.	1923–4.	1924–5.
	£	£	£	£	£
New South Wales ...	7,388,133	7,249,017	7,799,118	7,988,131	8,115,151
Victoria	3,846,833	3,791,174	4,077,046	4,476,158	4,947,393
Queensland	3,682,642	3,420,296	3,330,885	3,617,201	3,914,160
South Australia ...	1,622,076	1,778.576	1,816,776	1,841,720	2,290,755
Western Australia ...	955,359	881,159	987,558	1,173,568	1,224,032
Tasmania	708,603	727,701	728,175	928,360	1,306,360
Total State taxation ..	18,203,646	17,847,923	18,739,558	20,025,138	21,797,851

The following table gives for the same period the State taxation per head of population in each of the States, and the aggregate for all the States combined.

State.	State taxation per head of population.				
	1920–1.	1921–2.	1922–3.	1923–4.	1924–5.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
New South Wales ...	3 10 8	3 8 2	3 11 9	3 12 3	3 12 0
Victoria	2 10 4	2 8 11	2 11 3	2 15 1	2 19 9
Queensland	4 18 1	4 9 0	4 4 6	4 9 2	4 13 9
South Australia ...	3 6 1	3 10 10	3 10 10	3 10 2	4 5 1
Western Australia ...	2 17 8	2 12 6	2 17 6	3 6 4	3 7 3
Tasmania	3 6 7	3 6 8	3 6 6	4 4 9	5 19 11
All States	3 7 3	3 4 9	3 6 6	3 9 8	3 14 4

Owing to the difficulty of obtaining complete and reliable data in respect of local government taxation, an entirely satisfactory return for a series of years cannot be compiled; but the following lists represent with a fair degree of approximation the total Australian taxation and the amount per head of population for the period 1901-25:—

Year.	Commonwealth taxation.	State taxation.	*Local taxation.	Total taxation.	
				Amount.	Per head.
	£	£	£	£	£ s. d.
1901–02	8,894,319	2,686,645	2,050,000	13,630,964	3 11 3
1902–03	9,685,055	3,128,650	2,150,000	14,963,705	3 17 3
1903–04	9,105.758	3,252,161	2,200,000	14,557,919	3 14 4
1904–05	8,799,530	3,347,573	2,350,000	14,497,103	3 12 11
1905–06	8,999,485	3,661,840	2,380,000	15,041,325	3 14 7
1906–07	9,648,556	3,986,922	2,490,000	16,125,478	3 18 10
1907–08	11,645,352	2,601,450	2,950,000	18,196,802	4 7 5
1908–09	10,844,067	3,512,355	3,230,000	17,586,422	4 3 1
1909–10	11.593,164	4,017,660	3,470,000	19,080,824	4 8 3
1910–11	14,350,788	4,195,485	3,560,000	22,106,273	4 19 11
1911–12	16,076,593	5,419,668	3,892,000	25,388,261	5 11 0
1912–13	17,117,828	5,065,213	4,200,000	26,383,041	5 11 2
1913–14	16,587,906	6,304,836	4,630,000	27,522,742	5 12 6
1914–15	16,870,596	7,000,395	5,050,000	28,920,991	5 16 4
1915–16	23,533,529	8,141,746	5,170,000	36.845,275	7 8 3
1916–17	24,527,040	8,998,077	5.460,000	38,985,117	7 18 6
1917–18	24,606,743	9,932.183	5,680,000	40,218,926	8 1 5
1918–19	32,864,486	11,971,254	6,024,000	50,859,740	10 0 2
1919–20	41,847,692	14,291,633	6,547,000	62,686,325	11 16 5
1920–21	52,427,421	18,203,646	7,450,000	78,081,067	14 8 7
1921–22	49,678,842	17,847,923	8,300,000	75,826,765	13 15 3
1922–23	49,885,017	18,739,558	8,600,000	77,224,575	13 14 2
1923–24	50,852,483	20,025,138	8,900,000	79,777,621	13 17 6
1924–25	52,835,690	21,797,851	9,000,000	83,633,541	14 4 11

* Approximate.

With the exception of some sparsely populated areas in New South Wales and South Australia, and of French Island in Western Port, Victoria, the whole of Australia is divided into municipal areas which for certain purposes are placed under purely local control. The constitution of the bodies exercising such control varies from one State to another, and even in the same State there is generally some distinction made between urban and rural areas, the former being usually designated cities, towns, boroughs, or municipalities, and the latter shires or road districts. Practically all these bodies have powers of local taxation. The principal form of taxation is the 'general rate,' often supplemented by 'special rates' for various purposes; they are practically all land taxes, some being imposed on unimproved values, others on annual values. In addition most of these bodies have powers, either under the acts constituting them or under special acts, to collect licence-fees in respect of certain privileges, e.g. dog licences, cart and carriage licences, and hawkers' licences. Combining the figures for rates and licences, the total taxation revenue of local governing bodies for the year ending 30 June

1925 was approximately £9,000,000. Certain bodies constituted for special purposes also have local powers of taxation, for example water-supply and sewerage boards, harbour trusts, marine boards, and irrigation trusts; in most of these cases, however, it is difficult (if not impossible) to draw the line clearly between taxation and payment for services, and no reliable figures can be given for the taxation proper included in the revenues of such bodies.

Thus for the year ending 30 June 1925 (a quite normal post-war year) the total taxation of Australia was approximately £84,000,000, or £14 4s. 11d. per head of population. The items are as follows:—

Taxing authority.	Total taxation.	
	Amount.	Per head of population.
	£	£ s. d.
Commonwealth Government ...	52,835,690	8 19 11
State Governments	21,797,851	3 14 4
Local governing bodies ...	9,000,000*	1 10 8
Total	82,633,541	14 4 11

* Approximate.

C.H.W.

Teal. See DUCKS AND GEESE.

Tea-tree, a name commonly given in Australia to plants belonging to two allied genera,

Leptospermum flavescens.

Leptospermum (q.v.) and *Melaleuca* (q.v.) of the family Myrtaceae. Many species of both genera occur widely throughout Australia, and *L. scoparium* is one of the few plants that are common to Australia and New Zealand; in the latter country it is known as 'manuka.' The popular name first appears in Cook's *Voyage Towards the South Pole* (vol. i, p. 99):—'The beer certainly contributed not a little. As I have already observed, we at first made it of a decoction of the spruce leaves; but finding that this alone made the beer too astringent, we afterwards mixed with it an equal quantity of the tea plant (a name it obtained in my former voyage from our using it as tea then, as we also did now), which partly destroyed the astringency of the other, and made the beer exceedingly palatable, and esteemed by everyone on board.' On the next page of the book there is a description and illustration of the 'tea plant' which show it to have been *L. scoparium.* The ti-tree, a *Cordyline,* is not an Australian tree at all, though *C. terminalis,* found along the New South Wales and Queensland coast is sometimes called 'ti-plant.'

Tebbutt, JOHN (1834-1916), born at Windsor in New South Wales on 25 May 1834, and educated at the parish school under Edward Quaife, in 1843 commenced the study of astronomy and in 1853-7 published in the Sydney press his observations on the variable star Eta Argus. He made minute observations of the Donati comet in 1858 and of the comet of 1860, discovered the great comet of 1861, and observed the return of Encke's comet. Altogether he minutely examined and kept under observation more than 40 comets. In 1862 he refused the offer of appointment as New South Wales government astronomer. In 1863 he erected a small observatory at the Peninsula, Windsor, which in the British *Nautical Almanac* of 1867 was listed among the principal observatories. In 1879 he built a brick observatory, installing a transit instrument and (in May 1886) an equatorial refractor of 8-in. aperture, 115-in. focal length. In 1881 he discovered another comet which he successfully photographed. In 1895 he was chosen first president of the British Astronomical Association (New South Wales branch). His published papers dealing with systematic observations of the lunar occultations of stars, made up to 1904, were of value in obtaining a fundamental meridian for Australia by absolute methods. Other observations were those of Jupiter's satellites, the transit of Venus in 1874, several transits of Mercury, and many lunar and solar eclipses. In 1908 he published *Sixteen Years of Meteorological Observations.* He died at Windsor on 28 November 1916. See ASTRONOMY.

J.V.C.-B.

Telegraphs. See POSTS AND TELEGRAPHS.

Telopea. See WARATAH.

Tench, WATKIN (1759-1833), born in 1759, probably in Wales, in 1776 joined the marines as 2nd lieutenant (1st lieutenant, 1778; captain-lieutenant, 1782; lieutenant-colonel, 1804; colonel-commandant, 1809); in 1794 he was given army rank as major (lieutenant-colonel, 1798; colonel, 1808; major-general, 1811; lieutenant-general, 1821). In 1786 he volunteered for service in New South Wales and was given command of a detachment of marines in the transport *Charlotte* of the first fleet (q.v.), which reached Port Jackson on 26 January 1788. On 18 March he presided over a court martial; the finding was objected

to by his commanding officer, Robert Ross (q.v.), and the members of the court martial were put under arrest, but released owing to the shortage of officers in the new settlement. The relations between Tench and Ross continued unpleasant, and in 1788 Ross asked, unsuccessfully, for his recall. He was highly cultured and possessed of scientific curiosity, and in 1789, while stationed at Rose Hill, discovered the Nepean River; he also made expeditions inland with his friend William Dawes (q.v.). His chief service to the settlement was his habit of keeping a daily journal, which he worked up into the reliable and vivacious *Narrative of the Expedition to Botany Bay, with an account of New South Wales* (three editions in 1789, with Dutch, French, and Swedish translations) and *Complete Account of the Settlement at Port Jackson* (1793). These narratives, written in an admirable literary style, are regarded by the best authorities as 'the most accurate, most orderly and most valuable description of life in the colony in the first days.' He left for England by H.M.S. *Gorgon* in December 1791. In 1794 he was serving in the *Alexander* under Rodney Bligh when she was captured by the French, and while a prisoner in France he acted as Bligh's aide-de-camp and interpreter. In May 1795 he returned to Plymouth, and in 1796 published *Letters written in France to a Friend in London between November 1794 and May 1795*. He retired from the service in 1821, and died at Devonport on 7 May 1833. W.J.

Tennis. See LAWN TENNIS.

Tennyson, LORD. Hallam Tennyson, second baron Tennyson, born at Freshwater in the Isle of Wight on 11 August 1852, is the eldest son of Queen Victoria's poet-laureate. He was educated at Marlborough and at Trinity College, Cambridge, and called to the bar at the Inner Temple. He was then for many years secretary to his father, whom he succeeded in the barony in 1884. In 1897 he published a biography of his father. In 1899 he was appointed governor of South Australia, which he reached in April; in January 1903 he became the second governor-general of the Commonwealth, after having acted as governor-general since the departure of Lord Hopetoun in July 1902. His appointment was only for the balance of his predecessor's term, and in January 1904 he returned to England to resume work on his father's poems, of which he published a complete annotated edition in 1908. (K.C.M.G., 1899; G.C.M.G., 1903; P.C., 1905.)

Tephrosia, a large genus of the family Leguminosae, consisting of herbs and shrubs, widely distributed over most warm regions and particularly numerous in Africa. The species indigenous to Australia are all endemic, with the exception of *T. purpurea*. The flowers are red, white, or purple, in pairs or clusters in a narrow spike; pod narrow, flattened. In Australia *T. purpurea* is reputed to be injurious to stock.

Teraglin, a fine edible fish (*Atractoscion atelodus*) attaining a length of three feet, and so far known only from the coast of New South Wales. It is a member of the large family Sciaenidae, which, though represented in Australian seas by less than a dozen species, occurs abundantly in many other parts of the world. A closely related fish, the Silver Teraglin (*Otolithus argenteus*), is a tropical species, ranging from the Red Sea and east African coast to Queensland. Very little is recorded of the occurrence or habits of these fishes, which, together with the related Jewfish (*Sciaena antarctica*), are of great economic value.

A.R.McC.

Teredo. See MOLLUSCA.

Terminalia, a genus of the family Combretaceae, consisting of trees, chiefly tropical; the species indigenous to Australia occur in its tropical regions. The flowers are small, green or white (rarely of other colours), in loose spikes or heads; calyx-tube urn-shaped, 5 cleft in the upper portion; petals obsolete; stamens 10, longer than the calyx; fruit ovoid, angular, cylindrical or compressed, or with two longitudinal wings; leaves alternate, rarely opposite, marked with minute pellucid dots often visible only under a strong lens. *T. catappa* (Indian Almond), the best-known species, is a large deciduous tree of 80 feet with branches spreading in horizontal whorls. It yields a dark-coloured substance known in the West Indies as Indian almond gum. The bark and leaves are astringent and contain tannin. In India the leaves are mixed with iron salts to form a black pigment with which the natives colour their teeth. The seeds are like almonds in shape and whiteness and are palatable, wholesome, and nutritious. The kernels yield a valuable oil similar to almond oil but a little more deeply coloured. The tree is ornamental, with a brown, waved, heavy, coarse-grained timber. It grows near the coast, and its fruits are specially adapted for dispersal by ocean currents owing to the layer of buoyant fibrous tissue between the seed and the outer coat.

Termites, often called 'white ants,' may be conveniently classified in three families under the order Isoptera (q.v.). All three, Mastotermitidae, Calotermitidae, and Termitidae are represented in Australia by a total of 116 described species; in addition, species of Calotermitidae are known from Tasmania. Of the 13 genera represented the most important are *Eutermes* with 32 species, *Hamitermes* with 23 species, and *Calotermes* with 21 species; the remaining genera are *Mirotermes* (11 species), *Coptotermes* and *Microcerotermes* (each with 6 species), *Stolotermes* and *Leucotermes* (each with 4 species), *Porotermes* and *Rhinotermes* (each with 3 species), and *Mastotermes*, *Parrhinotermes*, and *Ahamitermes* (each with a single species). Their nearest allies are to be found among the Orthoptera, especially among the Blattidae (cockroaches). In their complex social system and division into several castes they resemble the true ants of the order Hymenoptera, but structurally they are widely separated.

Normally a community of termites comprises three distinct castes—male and female winged adults, soldiers, and workers—as well as the immature forms from which they are developed. The soldiers and workers are of either sex, and may be further divided into major and minor forms—which, in the soldier caste, often differ remarkably from each other.

Reproduction is generally effected by dealated winged adults, which then become what are known as true kings and queens; but many species are capable of producing neoteinic or supplementary forms, with which to replace dead or worthless true kings and queens. In these the development of the wings, if it has commenced at all, ceases soon after the ap-

Hamitermes wilsoni, near Townsville (Q).

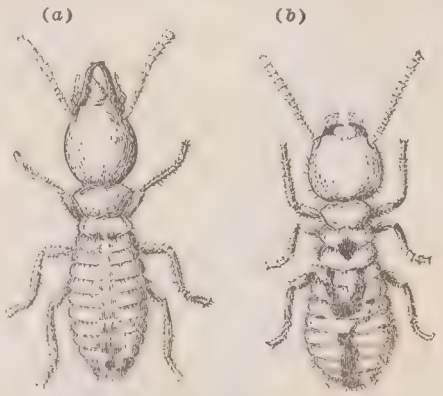
Eutermes palmerstoni, near Darwin, Northern Territory.

pearance of the wing-buds in nymphs ordinarily destined to develop into normal winged adults (potential true kings and queens); the organs of reproduction, however, continue to develop in an apparently normal manner. Mature neoteinic queens are known to consort with true kings, but the converse has not been recorded. It has been found in the case of a species of *Hamitermes* that, when the true queen is removed from the nest, one or two neoteinic queens are substituted; and these, mated with true kings, are capable of maintaining the population of the nest at approximately its former number. Similar experiments with a species of *Eutermes* have invariably resulted in the disappearance of the colony. True queens appear to be entirely wanting in the nests of certain species of the genus *Hamitermes*, notwithstanding the fact that in some, at any rate, immense numbers of winged adults are produced annually. In these cases it is not uncommon to find a single nest containing upwards of 100 mature neoteinic kings and queens, with or without one or more true kings. In their development towards maturity nymphs not destined to become neoteinics pass through two moults subsequent to the appearance of the wing-buds, emerging after the final moult as large, creamy-white, soft-bodied creatures with delicate white crinkled wings. During the next few weeks the integument hardens, the wings become more or less rigid, and the insect assumes a yellow or brown colour, the abdomen becoming distended with nutritive fatty matter. In this condition the mature winged forms remain in the nest until the moment of 'swarming.'

White Ant (*Coptotermes*), male.

A termite of the soldier caste may be differentiated when, after undergoing several moults, it emerges as a whitish creature with enlarged head of characteristic form. As development proceeds, the head (especially the mandibles) increases in size and becomes dark in colour. The size and form of the mandibles vary greatly, and provide reliable characters for the differentiation of most genera. In the genus *Eutermes*, of which there are 32 described Australian species, the head is always more or less pyriform and terminates anteriorly in a long, slender snout, bearing at its apex the external opening of the large excretory gland at the base of the head. The mandibles are very small, and are of little use in defence or attack; but a honey-like fluid ejected from the tip of the snout provides them with a means of protection far more potent than the immense jaws of any of the larger termites. Eyes are absent in all soldiers except those belonging to the Calotermitidae; in these they are rudimentary.

The worker caste exists among all termites except the Calotermitidae, among which the nymphs function as workers. Typically the head is large, broad, and rounded posteriorly; the mandibles are short and broad, with a few angular teeth at the apex and a large molar at the base. Eyes are wanting. Upon this caste devolves the duty of gathering food, building the nest or termitarium, feeding the young and the adults of other castes, carrying off and disposing of the waste matter from, and assisting in the defence of, the colony.



Coptotermes (*a*) soldier (*b*) worker.

At the time of the annual colonizing flight ('swarming') the winged adults leave the nest almost simultaneously and in vast numbers; after a short, feeble flight, they settle on the ground, where the wings are broken off and pairing takes place. Comparatively few survive the attacks of lizards, birds, predaceous ants, etc., which gather from all quarters as soon as the flight commences. The surviving couples seek shelter in tussocks of grass, under logs, pieces of wood and bark, or in crevices at the base of trees; here they attend to their own wants until such time as a young colony is reared and the individuals comprising it become capable of carrying on the duties ordinarily performed by the respective castes. The longevity of the male and female parent (king and queen) has not been determined, but it is certain that the latter outlives the former by many years, and for some time becomes increasingly fertile. During the period of her greatest fecundity the abdomen of the queen is much distended, owing to the remarkable development of the ovaries, but in most other respects she retains her pre-nuptial appearance. In many species she is confined within a specially constructed cell, from which she cannot escape; in others she wanders at will throughout the nest, depositing her eggs in the ordinary cells and galleries.

The largest and certainly the most destructive species, *Mastotermes darwiniensis*, is otherwise remarkable in being the most primitive of all known termites; it forms a connecting link with the cockroaches, both in details of its structure and in the habit of laying its eggs side by side in a double row cemented together with a gelatinous substance. The queen of this species is not known, but it is almost certain that she differs very little in external appearance from the de-alated adult. The nests of the various species differ widely in appearance. Some, built underground at the base of stumps or posts, are in the form of tier upon tier of large flat-

tened cells constructed of comminuted ligneous matter (*Mastotermes*); some are merely galleries and passages tunnelled in roots, logs or trees (Calotermitidae and certain species of Termitidae); others are woody or earthy termitaria of all sizes from small to very large (plate xlviii), built on the surface of the ground or in trees (*Eutermes, Hamitermes, Microcerotermes, Coptotermes,* and other genera).

The destruction of buildings, fences, and all kinds of woodwork, as well as of growing trees and plants, by termites constitutes one of the greatest problems in the development of Australia, especially of the northern parts. The most destructive species are to be found in the genera *Mastotermes, Rhinotermes, Coptotermes,* and *Eutermes,* all of which, except the first, are found in all parts of the continent. *Mastotermes darwiniensis* (plate xix, fig. 5) is widely distributed in tropical Australia, and extends as far south as the tropic of Capricorn. The annual loss caused by this species alone in northern Queensland and the Northern Territory probably exceeds that of any other insect-pest in the same area. Light has recently been thrown on this destructiveness, which is not shared by all termites. The principal constituent of wood is cellulose, which is indigestible except (*a*) by mammals that harbour intestinal bacteria, (*b*) by certain invertebrates which secrete an enzyme (cellulase) capable of breaking up woody fibre. The researches of L. R. Cleveland have established that protozoa provided with this enzyme live in the intestines of all termites that eat wood, and that such termites, when deprived of their protozoa, die in 10-20 days when fed on a normal wood diet, though they live for an indefinite period if fed on wood already otherwise digested. Once reinforced with the protozoa they regain their power of digesting wood. Immature and supplementary forms, as well as true kings and queens, are not infested with protozoa, since they subsist not on wood but on a fluid diet provided by the workers.

See Froggatt in *Proceedings* of the Linnean Society of New South Wales (1896-7); Silvestri's *Die Fauna Südwest-Australiens* (1909); Hill in *Entomological Research* (1922); Mjoberg in *Arkiv. for Zool.* (1920); and Tillyard's *Handbook of the Insects of Australia and New Zealand* (1926).

G.F.H.

Terns. See GULLS, TERNS, AND SKUAS.

Theatres. See DRAMA.

Therry, JOHN JOSEPH (1790-1864), born at Cork and educated at St. Patrick's College, Carlow, was ordained priest in 1815, assigned to parochial work in Dublin, and shortly afterwards made secretary to the bishop of Cork. In 1819 he met Father O'Flynn, who had just returned from Australia, and showed such great interest in the project of establishing a mission there that Bishop Slater of the Mauritius (in whose diocese Australia then was) asked him to join it and in 1819 despatched him and Father Philip Conolly (q.v.) as official Catholic chaplains for the settlement in New South Wales. He reached Sydney on 3 May 1820, and for the next 13 years was the most important—and often the only—Catholic priest in Australia. Approved (with limitations) by Macquarie, favoured by Brisbane, but persistently attacked and in the end suspended by Darling, he had to fight for every privilege that his co-religionists could claim to enjoy; it was not until Catholic emancipation was achieved in England, and Bourke had replaced Darling in New South Wales, that it became possible to obtain anything like equal treatment for all religious denominations. It was under Dr. Ullathorne (q.v.), as vicar general, and Dr. Polding (q.v.), as bishop, that Catholicism in the end was recognized as civilly on a par with Anglicanism; it was Father Therry's indomitable persistence through good and evil fortune that made this possible. After the arrival of Dr. Polding in 1835 Father Therry became merely, from the official point of view, one among many parish priests, and was transferred from headquarters at Sydney first to Campbelltown (1835), then to Hobart (where he was involved in a long and bitter dispute with Bishop Willson, q.v.), back to Melbourne (1846), and Sydney (1847), where he finally settled down as priest in charge of Balmain (1856). In 1858 he was made archpriest, and died at Balmain on 25 May 1864.

It is impossible within the limits of this article to narrate, or even summarize, the struggles, trials, and achievements of this remarkable man. Those interested in him may consult the *Life of Archpriest J. J. Therry* (Sydney, 1922), a biography documented from Therry's own papers. But the admiration and devotion which he inspired in his co-religionists may be instanced. Addressing Dr. Polding in 1835, the leading Catholics said of him:—'On his arrival in this colony, a great many years ago, he found us a scattered and a despised flock, but by his preaching and his great labours he formed us into a body. . . . We have known and witnessed his virtues, his toils, and his industry for the advancement of religion . . . the days of his vigour and his youth have been devoted to the objects of our spiritual and temporal happiness.' And 30 years later Archbishop Ullathorne, who had been his superior—and severe critic at times—praised his 'piety even to tenderness,' his obedience in trying circumstances, his 'boldness and confidence' in the matter of cathedral-building, and recorded 'how he really kept alive the faith, set the example of piety in his own person, forced on the authorities the religious freedom of the Catholic people, and even by his excess of zeal paved the way for the equal status of all religious denominations.' His most permanent single achievement was, perhaps the building of that church of St. Mary which afterwards became the Catholic cathedral in Sydney. Laughed at or rebuked by the colonial architect, the governor, the British secretary of state, and even his fellow-workers for the 'disproportionate' scale on which he commenced building, he maintained a firm faith in the future expansion both of his Church and of the colony, strained his resources to the utmost to make the building worthy of its purpose, and to the end of his life gave generous aid towards its completion. See ROMAN CATHOLIC CHURCH.

E.M.O'B.

Therry, SIR ROGER (1800-1874), born in Ireland on 22 April 1800, admitted to Gray's Inn in 1822, and called to the Irish bar in 1824 and to the English in 1827, soon found politics more interesting than law and engaged ardently in the campaign for Roman Catholic emancipation. This brought him into contact with George Canning, whose speeches he edited (with a memoir prefixed) in 1828. Through the influence of some of Canning's friends he was appointed commissioner of the court of requests in New South Wales, and reached

Sydney on 4 November 1829. He at once took up the cause of the then impoverished and ill-treated Roman Catholics, formed a lasting friendship with their priest and champion, John Joseph Therry (q.v.) and after a campaign lasting several years, including many appeals to English friends in parliament, succeeded in obtaining the rectification of nearly all the more serious grievances of his co-religionists. He became a strong supporter of Sir R. Bourke, who frequently utilized his services in the fight against exclusionist magistrates and settlers (see BOURKE, SIR R.); the injustice of the many attacks made on him, then and since, as a mere parasite of the governor is shown by the fact that under Gipps, a governor of very different qualities, his progress was even steadier and surer. In 1841 he was made attorney-general during the absence of John Hubert Plunkett in England, and as such sat in the old council untill its dissolution in 1843; in that year he was elected from Camden to the new council (after a sharp fight with Charles Cowper), resigned his seat in 1845 to become resident judge at Port Phillip, and in 1846 was brought back to Sydney as a puisne judge of the supreme court and primary judge in equity. Retiring with a pension in 1859, he returned to England and occupied himself with compiling reminiscences of his Australian experiences. According to the usual story the first edition of his *Reminiscences of Thirty Years' Residence in New South Wales and Victoria* was so full of injudicious revelations concerning colonial families that Therry himself withdrew it and substituted an expurgated edition. This statement is wholly incorrect. There were, certainly, two editions of the book; but both were published in 1863, the second containing a few pages of additional matter chiefly concerned with praise of Gipps's policy. The first edition is frequently on the market, the second very rarely.

Ill-health during Therry's later years forced him to live at Bath, where he died on 17 May 1874. (Kt. Bach., 1869.)

Thespesia, a small genus of the family Malvaceae, chiefly tropical. One species, *T. populnea,* is indigenous to Australia, occurring in Queensland and northern Australia. It is a coastal tree with large poplar-like leaves and showy flowers. The fruit contains large quantities of a yellow viscid juice, which is used as a dye. The wood resists decay under water, and is used for boat-building. The centre portions of old trunks decay like those of the European elm, and their wood acquires a deep claret colour. The inner bark yields a tough fibre, which is used for making coffee-bags; the finer parts of the fibre are used to make cigar-envelopes.

Thickheads OR **Whistlers,** a group of perching birds peculiar to Australia, the Pacific island, and the Malay region, constituting the family Pachycephalidae. In many ways these birds are intermediate between flycatchers (Muscicapidae) and shrikes (Laniidae), and some authors unite them with one or the other. There is no doubt that their closest relations are the Australian robins (q.v.); indeed, the yellow robins (*Eopsaltria*) are frequently included in this group.

The somewhat ugly name of 'thickhead' was bestowed on these birds because they are peculiar among perching birds (Passeriformes) in that the head is too large to pass through the neck when they are being skinned. It has been proposed to substitute the name 'whistler' for Australian members of the typical genus *Pachycephala,* since many of them are fine songsters. Besides the nine species of whistler, the family is represented in Australia by two endemic genera—one (*Oreoica*) containing only

Crested Shrike-tit
(*length* 9 *in.*).

the crested bell-bird, the other (*Falcunculus*) including the three species of shrike-tits. All these birds are insectivorous and arboreal in habits, seeking their food among the branches. They build open cup-shaped nests of twigs, roots, and fibres, placed in the fork of a tree or on branches.

Yellow-breasted Whistler
(*length* 7 *in.*).

The most familiar species throughout Australia is the Rufous-breasted Whistler (*P. rufiventris*), often called Echong, Wiree, or Native

Canary. The hen-bird is plain grayish-brown, with a speckled breast; the cock has a bright rufous breast, white throat, and black collar. Both sexes sing freely, their notes being beautiful and varied. The young male resembles the female, and not infrequently breeds when still in this plumage. The larger Yellow-breasted Whistler (*P. pectoralis*) is also well-known throughout Australia and Tasmania. The hen-bird of this species is also dull-coloured; the cock is very handsome, with black head and collar, white throat, and yellow underparts. Its song is very sweet, but not so continuous as that of the rufous-breasted bird The other whistlers are mostly shy birdsfrequenting dense forest country, and several are confined to the northern areas. The Crested Bell-bird (*Oreoica cristata*) represents the family in the drier inland regions of the continent, where its clear bell-like note is a familiar bush sound. It is reddish-brown, with white face and underparts, and a black erectile crest—and must not be confused with the green bell-bird or bell-miner found in forest country in the south-east, which belongs to the honey-eaters (see MINERS).

Shrike-tits are greenish-yellow above and bright yellow below, and like the crested bell-bird have black erectile crests. One species (*F. frontatus*) is found throughout eastern Australia, a second (*F. leucogaster*) occurs in the south-west, and the third (*F. whitei*) inhabits the extreme north of the Kimberley division of Western Australia. The genus thus affords a striking instance of discontinuous distribution. Shrike-tits usually keep high up in the trees, clambering about the small twigs and often hanging upside down to investigate the under-surfaces of leaves. Their nests, beautiful little cup-shaped structures, are placed among slender branches, and are usually inaccessible. They have, in proportion to their size, extremely stout and powerful bills. W.B.A.

KEY TO EGGS ON PLATE XLIX.

1. White-fronted Chat (*Ephthianura albifrons*).
2. Crimson Chat (*Ephthianura tricolor*).
3. Orange Chat (*Ephthianura aurifrons*).
4. Yellow-breasted Chat (*Ephthianura crocea*).
5. & 6. Gibber-bird (*Ashbyia lovensis*).
7. Australian Reed-warbler (*Acrocephalus australis*).
8. Long-billed Reed-warbler (*Acrocephalus gouldi*).
9. Golden-headed Fantail-warbler (*Cisticola exilis*).
10. Little Grass-bird (*Megalurus gramineus*).
11. Striated Grass-bird (*Megalurus striatus*).
12. Tawny Grass-bird (*Megalurus galactotes*).
13. Spinifex Bird (*Eremiornis carteri*).
14. Rock-warbler (*Origma rubricata*).
15. Speckled Warbler (*Chthonicola sagittata*).
16. Little Thornbill (*Acanthiza nana*).
17. Fairy Thornbill (*Acanthiza pygmea*).
18. Western Thornbill (*Acanthiza inornata*).
19. South-western Thornbill (*Acanthiza mastersi*).
20. Brown Thornbill (*Acanthiza pusilla*).
21. Varied Thornbill (*Acanthiza spuamata*).
22. Brown-tailed Thornbill (*Acanthiza diemenensis*).
23. Broad-tailed Thornbill (*Acanthiza apicalis*).
24. Robust Thornbill (*Acanthiza robustirostris*).
25. Red-tailed Thornbill (*Acanthiza hamiltoni*).
26. Striated Thornbill (*Acanthiza lineata*).
27. Pale Chestnut-tailed Thornbill (*Acanthiza condora*).
28. Chestnut-tailed Thornbill (*Acanthiza uropygialis*).
29. Yellow-tailed Thornbill (*Acanthiza chrysorrhoa*).
30. Buff-tailed Thornbill (*Acanthiza reguloides*).
31. Pallid Thornbill (*Acanthiza pallida*).
32. Tasmanian Thornbill (*Acanthiza ewingi*).
33. Southern Slender Thornbill (*Acanthiza tenuirostris*).

Thierry, BARON DE. See NEW ZEALAND.

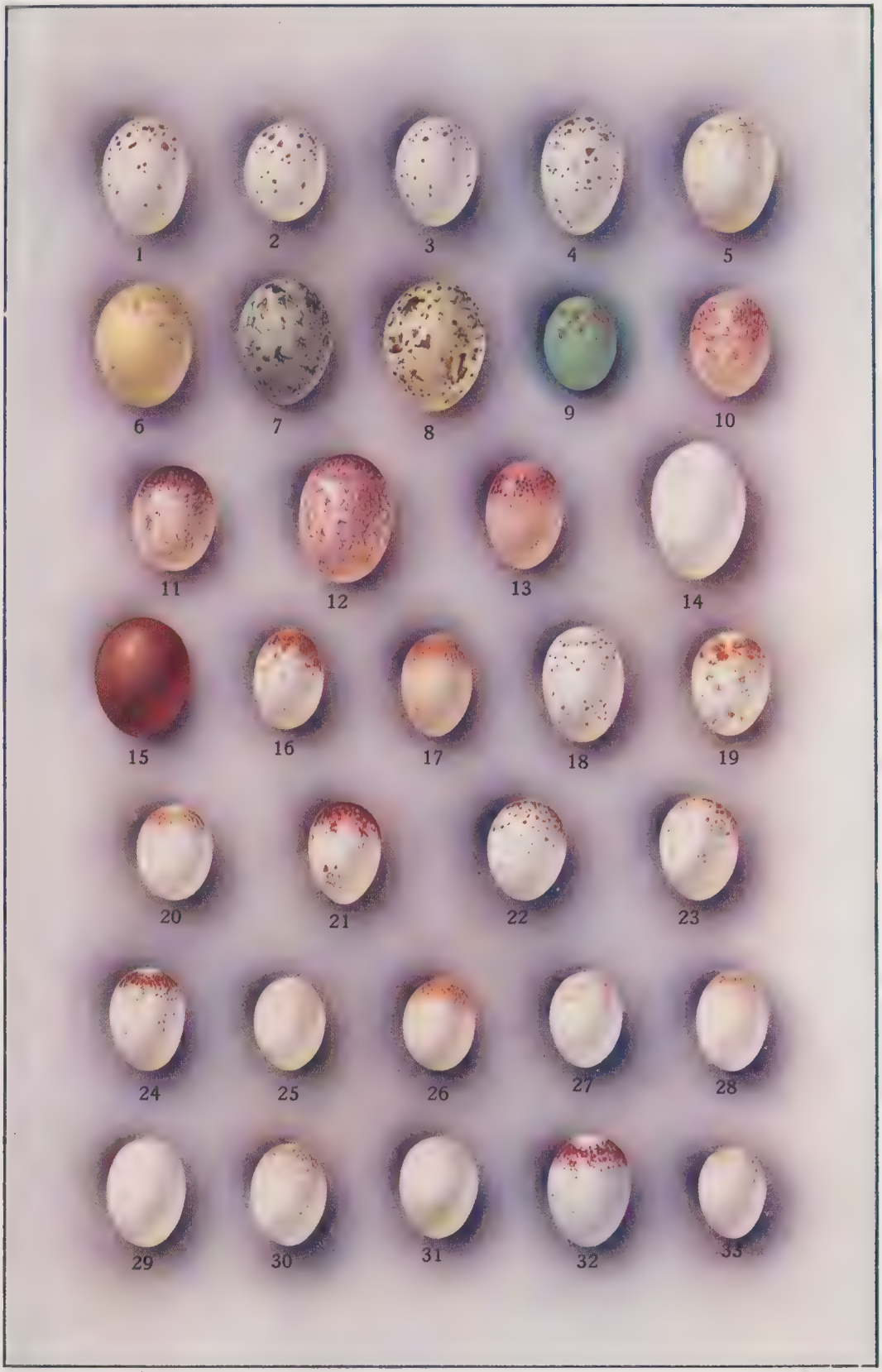
Thistles. See NOXIOUS PLANTS.

Thomas, ROBERT (1782-1860), founder of a well-known South Australian family, was born at Rhantregwywyn in Montgomeryshire on 16 November 1782, and spent twenty years of his business life as a publisher and law stationer in Fleet-street, London. In the early 1830s he began to dally with the idea of migrating to South Australia, partly because friends of his were taking up land there, partly because it offered a career for his sons; and in 1836 George Stevenson (q.v.), who had resigned the editorship of the *Globe* newspaper to become private secretary to Governor Hindmarsh, suggested to him that they should jointly establish a newspaper in the new colony. The first issue of the paper—*The South Australian Gazette and Colonial Register*—was published in London on 18 June 1836, Robert Thomas having disposed of his other business in March; on 28 June he and his family left London in the *Africaine,* taking with them a Stanhope press, a fount of type, and two employees for the printing works. They landed at Glenelg on 11 November, and the second issue of the paper was published at Adelaide on 3 June 1837. For a time its appearances were irregular, but in June 1838 it became a weekly, in 1843 was issued twice a week, and in 1850 was transformed to a daily. From 1839 onwards its name was *The South Australian Register.* In 1839 Thomas fell foul of the new Governor, Colonel Gawler, over a quarrel with George Milner Stephen the colonial secretary, and in 1840 an attack on the governor's aboriginal policy led to Gawler's taking from the *Register* the whole of the government printing. In January 1841 Thomas returned to England to appeal against this decision, but obtained no redress, and the consequent loss of business and the financial crisis of 1842 broke up the Stevenson-Thomas partnership, and transferred the *Register* to other proprietors. Robert Thomas died at Adelaide on 1 July 1860.

See *The Diary and Letters of Mary Thomas,* 3rd edition (Adelaide, 1925).

Thomas, SIR ROBERT KYFFIN (1851-1910), eldest son of William Kyffin Thomas (q.v.) was born near Adelaide on 19 August 1851. He followed his father into the printing department of the *Register,* was moved to the reporting staff, in 1877 became a partner in the firm, and in the end took over control of all the mechanical and commercial departments of the office. The fourth generation of Thomases is now connected with the *Register.* Sir R. K. Thomas died at Adelaide on 13 June 1910. (Kt. Bach., 1910.)

Thomas, WILLIAM KYFFIN (1821-1878), son of Robert Thomas (q.v.) was born in London on 4 November 1821 and educated at Rickmansworth. He was apprenticed to the printing trade, and from the moment of his father's entry on newspaper publication became his right-hand man. In Adelaide he took charge of the typographical department of the *Register,* and—except for a short experience at the Victorian diggings—remained there through all the changes of proprietorship until in 1853 he and three others bought the paper from John Stephens. Thenceforth he devoted himself to the interests of the paper and, though a patron of many public movements, refused to take an



Drawn by N. W. Cayley and F. S. Rodriguez.

BIRDS' EGGS

(See names of the Birds on opposite page)

active part in politics or public life. He died at Glenelg on 4 July 1878.

Thompson, JOHN ASHBURTON (1846-1915), born in London on 31 July 1846, and educated at St. Paul's School, University College, and Guy's Hospital (M.R.C.S., L.R.C.P., L.S.A., 1868; M.D., Brussels, 1878; D.P.H., Cambridge, 1882), first visited Australia in 1878 in search of health after a breakdown from overwork. Returning to Sydney in 1884, he was employed by the New South Wales government to assist in combating an outbreak of smallpox, and in 1885 was appointed deputy medical adviser to the government. In 1896 he became chief medical officer of New South Wales and president of the board of health. He immediately occupied himself in the creation of a public health service for the colony, and in the drafting of a comprehensive public health act. Among his greatest achievements may be reckoned the Australian pure food laws. Appointed a royal commissioner to each State to formulate a model pure-food code, he procured the adoption by all the States of codes so essentially similar as not to be a restraint upon interstate trade, and in the mass admittedly forming one of the best instruments in existence for the protection of food-supplies.

He was a distinguished epidemiologist, and wrote authoritatively on leprosy and plague. He was the first to put forward the considered opinion that the infection of bubonic plague in human beings is derived from rats through the agency of fleas and in no other way; he supported this conclusion in a series of reports to the New South Wales government which influenced medical opinion throughout the world and have been largely quoted by other investigators. For this and similar work he was made an honorary fellow of the Royal Sanitary Institute. His most important writings are *A History of Leprosy in Australia* (1894), *Leprosy in Hawaii* (1896), *Contributions to the History of Leprosy in Australia* (1897), and reports on outbreaks of plague in Sydney (1900, 1907). He retired from the public service in 1913, and died in London in September 1915.—His brother GERALD MARR THOMPSON was principal critic in art, music, and drama on Sydney *Daily Telegraph* (1883-91) and *Sydney Morning Herald* (1891-1924). W.G.A.

Thomson, SIR EDWARD DEAS (1800-1879), born at Edinburgh on 1 June 1800 and educated at the Edinburgh high school, at Harrow, and at Caen in Normandy, studied mercantile methods and helped his father (Sir John Deas Thomson, accountant-general of the navy) to introduce into the service the double-entry system of bookkeeping. In 1826 he visited the United States and Canada, and in 1827 was appointed a registrar at Demerara in British Guiana; finding, however, that the clerkship of the legislative council of New South Wales was vacant, he effected an exchange and reached Sydney on 24 December 1828. Darling reported favourably on his zeal and ability, and Bourke (whose daughter he married in 1833) placed great confidence in him; on 2 January 1837 he succeeded Alexander Macleay (q.v.) as colonial secretary. The position was one of increasing influence and responsibility, and after 1843—when the governor ceased to take part personally in the proceedings of the legislative council—carried with it the leadership of the house. Thomson thus became responsible for introducing and defending government measures during a period when the opposition, headed by Wentworth and including Lang and Lowe, was particularly powerful; at the same time he creditably discharged the onerous duties of his administrative department. His tact and efficiency were recognized by the council in 1852, when a special allowance was voted for his services. During the constitutional debates of 1853-4 he supported Wentworth's conservative views, and in 1854, having been granted leave of absence owing to ill-health, accompanied him to England to watch the progress of the constitution bill through the British parliament. When responsible government was established in 1856 he retired from the colonial secretaryship on a pension of £2000; with a public testimonial of £1000 he founded a scholarship at the university for the study of natural science.

He was invited to form the first ministry, but failed, and became an original member of the new legislative council—in 1861 he was appointed a life-member. For a few months in 1856-7 he represented the Parker ministry in the council, but held no other official position under responsible government, and, except as an advocate of federation in 1857, took only a minor part in debate.

Thomson was an ardent supporter of higher education; he sat on Wentworth's select committee of 1849 (to enquire into the establishment of a university), was appointed to the university senate in December 1850, became vice-chancellor in 1862, and was chancellor from 1865 to 1878; in this capacity his previous administrative experience was invaluable. His portrait by Capalti and bust by Fantachiotti have been placed in the great hall of the university as a permanent testimony to his services. For many years he was president of the Australian Jockey Club. He died in Sydney on 16 July 1879. (C.B., 1856; K.C.M.G., 1874.)

Thomson, JAMES PARK, born in the Shetland Isles on 20 June 1854, in 1873-6 traversed many parts of North and South America and New Zealand, and in 1877-9 was employed in the New South Wales survey department. In 1880 he was appointed government surveyor in Fiji, where he did much exploration. He left the Fijian service in 1884 and travelled in New Guinea and the South Pacific islands. In 1885 he entered the Queensland survey department, founded the Queensland branch of the Royal Geographical Society of Australasia, and was its president from 1894 to 1897. He was instrumental in introducing to Australia the zone system of time-reckoning. In 1895 he was honorary vice-president of the sixth international geographical congress in London. In 1900 the Queensland branch of the Royal Geographical Society of Australasia inaugurated a Thomson Foundation Gold Medal in his honour, and in 1901 awarded him the first medal in recognition of his services to geographical science; in 1902 he received the Cuthbert Peek Grant from the Royal Geographical Society of London for the same reason. In 1906 he reported upon New South Wales government schemes of water conservation and irrigation, and in 1909 identified and astronomically determined the position of Burke and Wills's most northerly camp on the Bynoe River in the Gulf district.

He has published *British New Guinea* (1892) and *Round the World* (1904), and over 150 papers in scientific journals dealing with geographical and kindred subjects. (C.B.E., 1920.) L.A.

Thorn, GEORGE (1838-1905), son of George Thorn who founded Ipswich in Queensland, was

born at Sydney on 12 October 1838 and educated at The King's School and the university of Sydney (B.A., 1858). For nine years he raised sheep and cattle, but in 1867 entered politics as member of the Queensland assembly for West Moreton, moving to Fassifern in 1873 when his electorate was divided, but leaving the assembly for the council in the following year. He was postmaster-general in the Macalister ministry of 1874-6, and secretary for public works in the Douglas ministry of 1877-9; between the two he formed a stop-gap ministry of his own, holding both the offices just mentioned, and for a time governing the country from the council—an uncommon situation—but securing as soon as possible the assembly seat for Ipswich. This premiership resulted from a dispute between other would-be leaders, and was not taken seriously even by Thorn himself; indeed, his lack of achievement as a politician was probably due to his overflowing sense of humour and the consequent belief of his fellow-members that his proposals were meant for jokes. This belief certainly settled the fate of his 1876 bill for paying members of parliament. Another bill of his, excluding Asiatics from goldfields less than two years old, was lost by refusal of the Queen's assent after both houses had passed it, and the credit of carrying it (with an extension to three years) therefore came to his successor Douglas. In February 1878 Thorn resigned his seat in the council and left the ministry to be one of the Queensland commissioners to the Paris exhibition; returning in 1879, he sat for Dalby (1879) and Fassifern (1887), but lost his seat in 1902 and took no active part in politics thenceforth. He died in 1905.

Thorn Apple. See NOXIOUS PLANTS.

Thorn-back Ray. See SKATES.

Thornbills, a name generally used in Australia for certain very small perching birds, peculiar to Australia and Tasmania, that belong to the genus *Acanthiza,* usually placed among the warblers (Sylviidae). They are small olive-brown or olive-green birds, with a dark band across the tail, often with a patch of bright

Yellow-tailed Thornbill (*length* 3½ *in.*).

colour (yellow or rufous) at its base, and are found in small flocks, busily hunting for insects among the foliage of trees and shrubs, constantly uttering their twittering notes, which sometimes extend into spirited little songs. They are undoubtedly very valuable birds in forest and orchard, as they feed on small caterpillars, leaf-hoppers, and other leaf-destroying insects.

They build oval, dome-shaped nests, with an entrance at the side, and lay white eggs spotted with red. About a dozen species are known, among which the most familiar are the Brown Thornbill (*A. pusilla*) and the Yellow-tailed Thornbill (*A. chrysorrhoa*), both found throughout eastern Australia. The latter has the remarkable habit of constructing a double nest, the lower cavity being lined with feathers and containing the eggs; the upper is unlined, and is said to serve as a roosting-place for the cock-bird at night. It has also been suggested that this upper chamber is intended to deceive cuckoos, and perhaps other enemies; of this there seems to be no evidence. The writer has seen a nest in which there were two of these upper unlined chambers in addition to the nest proper, but this is very unusual. The Striated Thornbill (*A. lineata*) ranges from South Australia through Victoria and New South Wales into southern Queensland. W.B.A.

Thrasher. See THRESHER SHARK.

Threadfins, tropical fishes of the family Polynemidae with slender filaments beneath the pectoral fins, which can be moved freely in all directions and may be quite short or longer than the body of the fish itself. They are tactile organs, and enable the fish to find its food in intensely muddy estuarine waters. A species common in Queensland, *Polynemus tetradactylus,* is known in the northern towns as Salmon or Cooktown Salmon, though it bears no resemblance to or affinity with the true salmon of the northern hemisphere. It occurs in shoals, and meets with a ready sale in the northern markets. Threadfins rarely extend southward to the coast of New South Wales, but are plentiful along the northern seaboard. Some species attain a length of six feet. A.R.McC.

Threlkeld, LANCELOT EDWARD (1788-1859), was born at Hatherleigh in Devon though his family belonged to the village of Threlkeld in Cumberland. The London Missionary Society accepted his offer for service, and he was ordained in November 1815. In January of the following year he and his wife, together with William Ellis, embarked for Sydney in the convict ship *Atlas*; but owing to the sickness and death of his first child he was detained for a year at Rio de Janeiro, where he acted as the first ordained minister to the Protestants. In 1817, after a short stay at Sydney, he landed at Eimeo in the Society Islands, but in 1818 joined with John Williams in establishing a mission on Raiatea. In 1824 he decided to visit England, but while at Sydney accepted the suggestion of Sir Thomas Brisbane to establish, under the auspices of the London Missionary Society, a mission to the aborigines at Lake Macquarie for which the governor, on 8 February 1825, made a grant of 10,000 acres. In 1828 an acrimonious correspondence took place between the society and himself regarding the expenses of the mission, and he was dismissed, the society offering to pay his passage home. With the assistance, however, of friends in the colony he continued the mission, but transferred it to the opposite side of the lake, where he had received another grant of land, this time from Governor Darling. On 8 January 1831 he was confirmed in his position by the executive council, which voted him a salary of £200 per annum, and the mission was maintained till 1841, by which time very few natives were left. He then became pastor of the Congregational church at Watson's Bay (where he also conducted a day-school) until 1845, when he was

appointed to the Mariners' church, Sydney, ministering there till his death on 9 October 1859. See CONGREGATIONALISTS.

He made a study of the native language, and between 1826 and 1850 published schoolbooks and translations of various parts of the Scriptures. His chief work is his *Australian Grammar* published in 1834 at the joint expense of the colonial government and the Society for the Promotion of Christian Knowledge. A second edition was printed in 1850. At the time of his death he was engaged in completing the translation of the four Gospels. The following are in the Mitchell Library at Sydney:—*The Aboriginal Mission, N.S.W.* (Sydney, 1825); *Specimens of a Dialect of the Aborigines of N.S.W.* (Sydney, 1826); *A Statement relating to formation and abandonment of a Mission* (Sydney, 1828); *An Australian Grammar* (Sydney, 1834); *Australian Spelling Book* (Sydney, 1836); *Report of the Mission to the Aborigines at Lake Macquarie* (Sydney, 1838); and *Key to the Structure of the Aboriginal Language* (Sydney, 1850).

See *An Australian Language, edited with appendix etc.* by John Fraser (Sydney, 1892) and Nancarrow's *Days of Long Ago* (Newcastle, N.S.W., 1914). K.B.

Thresher Shark, a species (*Alopias vulpinus*) also called Fox Shark and Thrasher, which ranges over all seas and has an undeserved reputation for attacking whales, apparently based upon erroneous observation. It attains a length of 15 feet, half of which consists of the strangely elongated tail, with a greatly produced upper lobe. The vernacular name is derived from its habit of splashing the water with its tail as it swims round a shoal of fish, thereby scaring them into a crowded mass and so facilitating their capture. Seamen commonly assert that this threshing habit is also directed against whales, the shark beating out the life of the large mammal; this feat, however, is impossible and would be useless, as the small teeth of the shark would not allow it to feed upon its larger antagonist.

Thresher sharks are not uncommonly observed off the Australian coast when shoal-fish are present, and are often confused by casual witnesses with killer-whales (*Orca*). A.R.McC.

Thrips, generic name of the typical genus of the insect order Thysanoptera, very small, delicate, and elongated insects which are either wingless or provided with two pairs of closely similar slender wings, fringed with long hairs and lacking definite venation. The mouth-parts are remarkably specialized from the ordinary biting type into one suitable for rasping and sucking plant-juices; these are extracted by means of well-developed sucking-styles. The tarsi end in a bladder-like organ; hence the order is sometimes called Physapoda. Between two and three hundred of these insects have been described, about 70 from Australia; it is evident that this continent is the headquarters of the group, possessing at the same time the largest and the most highly specialized types. Uzel divides the order into two sub-orders—Terebrantia, in which the females possess an external toothed ovipositor, and Tubulifera, in which the tip of the abdomen is produced into a tubular process. Most Australian species belong to the latter division.

One of the commonest species (and one of the largest of the order) is the Giant Thrips (*Idolothrips spectrum*). This insect may be shaken out of any heap of dead leaves and eucalyptus branches in the bush. The type specimens were collected by Darwin in 1836. The advanced state of our knowledge of this order in Australia is chiefly due to Hood, who has added many genera and species to its fauna. The most abundant genera are *Haplothrips, Liothrips* and *Cryptothrips*. A large number of Australian species make galls in the leaves of native shrubs and trees; these are commonly to be seen on wattles, bottle-brushes, etc., in the drier districts.

Several introduced species are pests, notably the Rose Thrips (*Thrips tabaci*), which causes much damage in gardens, and *Heliothrips haemorrhoidalis*, which attacks native shrubs as well. The name 'thrips,' having been adopted as an English word, is often thought to be a plural noun, and many writers talk of a 'thrip.' This is incorrect.

See Uzel's *Monographie der Ordnung Thysanoptera* (1905); Froggatt in the *Proceedings* of the Linnean Society of New South Wales; and Hood in the *Memoirs of the Queensland Museum* (1918) and *Proceedings* of the Biological Society of Washington (1919). R.J.T.

Throsby, CHARLES (1771-1828), born at Leicester in England in 1771, reached New South Wales on 13 June 1802 as surgeon of the convict-transport *Coromandel*. On 13 October King made him acting-surgeon and magistrate at Castle Hill; on 1 August 1804 he was transferred to Newcastle in the same capacities, and on 30 April 1805 was made commandant at that station. On 21 September 1809 he resigned all his offices to act as agent for Sir John Jamison (q.v.). In December 1813 he was granted 500 acres at Cabramatta for his services at Newcastle. Macquarie was for several years inclined to suspect him of disaffection, and in 1817 coupled him with the Blaxlands and Marsden as having 'always manifested an Opposition to the Measures and Administration of Governor Macquarie:' but in 1819 Throsby's successful explorations (which are described under EXPLORATION BY LAND) had won Macquarie's heart, and he was eulogized in a general order and given 1000 acres at Bong Bong as a reward for his 'zeal and perseverance.' On 16 July 1825 he was appointed to the legislative council. In 1817 Garnham Blaxcell, a friend for whom he had pledged himself in the sum of £5000, absconded to England and died on the way there; the creditors sued Throsby for the money due, the resulting litigation was long drawn out, and in 1827 was decided against him. Worn out with ill-health and anxiety, he shot himself at Glenfield (near Liverpool in New South Wales) on 2 April 1828. He died without issue.

Thrushes, perching birds belonging to the family Turdidae. This family is represented in all parts of the world except New Zealand, though in Australia its sole native representative is the Ground or Mountain Thrush (*Oreocincla lunulata*), an inhabitant of forest country throughout eastern Australia and Tasmania. The name 'mountain thrush' is the more distinctive, since that of 'ground-thrush' is often given to the ground-birds (q.v.). The best-known so-called thrushes in Australia are the shrike-thrushes (q.v.). Two other true thrushes have been introduced from England, and are common in the suburbs of Sydney, Melbourne, and Adelaide; these are the Song-thrush (*Turdus philomelos*) and the Blackbird (*Turdus merula*), both of which are famous song-birds.

The mountain thrush is brown above and whitish below, with prominent crescent-shaped black marks on the feathers of both surfaces. It spends the summer among the ranges, building a

Mountain Thrush (*length* 10½ *in.*).

large nest of moss lined with fibres in the lower branches of a tree. In the winter it descends to lower country. Though a member of a family of musicians, its song—a sweet utterance much like the blackbird's—is rarely heard. Its food consists almost entirely of ground insects.

W.B.A.

Thrush, Little. See THICKHEADS.

Thylacinus. See TASMANIAN WOLF.

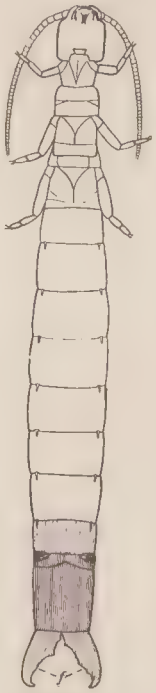
Thymelaceae, a large and widely distributed family of shrubs and trees (rarely herbs); four genera are indigenous to Australia. The flowers occur in heads, clusters, or spikes. The genus *Pimelea,* with 76 species, is limited to Australia and New Zealand. *P. haematostachya,* a Queensland species, has showy spikes of flowers of a blood-red colour. It is suspected of poisoning stock, as are several other species; in some cases, perhaps, the fibrous and therefore indigestible bark of the twig is the source of the trouble. The bark of *P. ligustrina,* an ornamental shrub, furnishes a fibre of great strength. The aborigines use the fibre of several species for making fishing-nets and cordage. *P. physodes* (Quailup Bells), a Western Australian species, has a head of small flowers enclosed in a globular cup (involucre) formed by the pinkish-yellow floral bracts. *Drapetes* has one endemic species, *D. tasmanica,* found only at high elevations in Victoria and Tasmania. *Wickstroemia* has a wide, chiefly tropical, range. The only indigenous species is *W. indica* (which extends through Malaysia to China), usually found along the coast. It has ornamental red berries.

Thysanoptera. See THRIPS.

Thysanotus, a genus of the family Liliaceae, consisting of herbs with a thick horizontal root-stock; some species have elongated tubers. One species extends to the Philippines and southern China; the rest are endemic in Australia. The flowers—commonly called fringed violets—are violet-coloured, with fringed margins, and occur in clusters of two or three on a long flower-stem; leaves grass-like. Of the 21 species 14 are found in Western Australia.

Thysanura, a small order of insects commonly known as silverfish or bristle-tails—the most archaic of all insects—wingless, and easily recognized by the presence of ten abdominal segments and a pair of cerci. The number of described Australian species is only about 20, of which most belong to the dominant family Lepismatidae. The order is divided into two well-marked sub-orders. In the sub-order Ectotrophi the jaws project beyond the mouth, and there is a median jointed tail-process as well as a pair of cerci.

Australia possesses a single described representative of the family Machilidae—*Allomachilis froggatti,* a brown, shrimp-like insect with great powers of leaping; it has been found in caves and under stones along the seashore in New South Wales. In the family Lepismatidae a number of species have been described belonging to the genera *Heterolepisma, Acrotelsa, Atopatelura,* and *Atelura*; the last-named genus inhabits ants' nests, the commonest species being *A. cursitans.* The introduced silverfish which does so much damage to books and clothes is *Ctenolepisma longicaudata,* a native of South Africa.



Species of *Heterojapyx.*

In the sub-order Entotrophi the jaws are retracted within the head, and there is no median tail-process. No species of the ancient Campodeidae has yet been described from Australia; but the more specialized Japygidae (which resemble wingless earwigs) are represented by several forms, of which the most remarkable are the gigantic species of the genus *Heterojapyx. H. victoriae,* from Victoria, and *H. gallardi,* from New South Wales and Queensland, both measure up to two inches in length; they are to be found under rocks and logs, as well as deep down in the soil.

See Silvestri's article in *Die Fauna Südwest Australiens* and Alexander's paper on 'Aptera of Australia' in the *Report* for 1913 of the Australasian Association for the Advancement of Science.

R.J.T.

Tichborne Claimant. See ORTON, ARTHUR.

Tick-bush. See KUNZEA.

Ticket of Leave. See CONVICTS.

Ticks. The super-family Ixodoidea is divided into the two families Ixodidae and Argasidae.

In the Ixodidae the genera of most importance are *Ixodes, Haemaphysalis,* and *Boophilus* (for which see CATTLE-TICK). *Ixodes* includes many species; the best-known is *I. holocyclus* (Dog, Bluebottle, or Scrub Tick), whose bite causes a fatal paralysis in human beings (especially children), dogs, and other domesticated animals if the tick is not quickly removed. Its natural hosts—kangaroos, opossums, marsupial rats, and tree-shrews—are immune. Other Australian species are *I. ornithorhynchi,* found on the platypus; *I. tasmani,* on opossums, native cats, and koalas in Tasmania; *I. fecialis,* on native cats, opossums, and bandicoots; and *I. australiensis,* whose hosts are domestic animals and the marsupial rat-kangaroo. Sea-birds in Australian waters are infested by *I. putus, I. percavatus,* and *I. endyptidis,* among other

species; and the world-wide *I. vespertilionis* occurs on Australian bats. Among species of *Haemaphysalis* recorded in Australia are *H. bispinosa*, which infests cattle and horses in the eastern coastal districts; *H. bancrofti*, found on kangaroos; and *H. humerosa*, found on bandicoots. *H. leachi*, the cause of piroplasmosis in dogs, is rare in Australia. Ticks belonging to the genus *Amblyomma* and sub-genus *Aponomma* are found on lizards, snakes, and other native animals.

The second family, the Argasidae, contains two genera, *Argas* and *Ornithodorus*. *A. persicus*, the common fowl-tick, is the vector of the organism of avian spirochaetosis, and therefore the cause of great loss to poultry-farmers. See ACARINA.

Tides. Any attempt to follow the progress of the tidal wave on the coast of Australia necessarily involves an investigation of the rival theories of the origin of tidal phenomena; but the difficulties are so great, on account of the complicated nature of the problem, and the incompleteness of the information at our disposal, that only a short summary of the main facts can be given in this article.

In 1687 Newton, having reduced the knowledge of universal gravitation to a practical form, established a reasonable theory of the cause of the tides. Assuming the sea to be confined to a broad canal encircling the equator, he determined by mathematical calculation the relative attractions of the sun, moon, and earth upon this supposititious ocean, and showed that, when the sun and moon are in conjunction or in opposition, their gravitational forces are combined, resulting in the highest flood and lowest ebb tides. In the quadratures the sun raises the water which the moon depresses, and depresses the water which the moon raises, and the result is the minimum or neap tides. The result of this alternate combination and opposition of the solar and lunar attractions is to change the figure of the ocean to an egg-shaped form, the technical name of which is a 'prolate ellipsoid or revolution.' If the relative motions of the earth and moon were such that the water so attracted had time to assume its form of equilibrium at each moment of time, the subject of tidal flow would be a simple one; but, under the known conditions of the respective revolutions of the earth and moon, the form of equilibrium can never be attained by the ocean. Nevertheless the equilibrium theory of Newton forms the basis upon which all tidal investigations and predictions have been carried out.

Newton's theory has been adversely criticized because, according to it, high water should occur at midnight at every full and change of the moon—in other words, the 'establishment' of all parts should be zero—whereas actual observations show the establishment to have all sorts of values from zero to six hours. From this it would appear that the theory is as nearly wrong as possible in respect of the time of high water. But we cannot ignore the existence of large land-masses distributed over the earth's surface, with all sorts of shapes and areas, causing numberless deflections of the tidal wave, as well as innumerable counter-currents and vortices; these masses, therefore, do not give the theory a fair chance. Moreover, a wave travels at different speeds according to the depth of water in which it moves; and, as the ocean floor varies continually and considerably in depth, many complications are thereby introduced. It is unthinkable that a man of Newton's calibre could have ignored these serious disturbing factors. His theory was a purely mathematical investigation of prime causes, and was not intended for practical use without modifications.

It remained for Sir George Darwin in *The Tides and Kindred Phenomena of the Solar System* to explain the discrepancies which have been found between the equilibrium theory and actuality. Darwin accepts the theory of the tides as a world-wide phenomenon, and considers that the main tidal wave is formed in the world-encircling stream known as the Southern Ocean, and spreads northward into the Pacific, Atlantic, and Indian oceans at a rate depending mainly upon the depth of the water. In support of this theory he reproduces a chart (originally drawn by W. Whewell in 1833, amplified by Sir G. B. Airy, and included in his article on 'Waves and Tides' in the *Encyclopaedia Metropolitana*) showing the co-tidal lines of the world and the progression of the tidal wave from the Southern Ocean northward. It is unfortunate that, so far as the coast of Australia is concerned, the co-tidal lines shown on Darwin's map are not correct, and the progression of the tidal wave cannot be as he shows it. On the western coast the times of high water at full or change (the 'establishment') are in places as much as four to six hours out; on the northern coast the progression of the wave is shown as from east to west—whereas, as will be shown later on, the rise and fall of the water there are largely controlled by the wind, so that no definite direction for the tidal stream can be laid down.

In 1904 Rollin A. Harris, of the United States coast and geodetic survey, enounced an entirely new theory of the origin of the tidal wave. After investigating the seiche movement in a lake of known shape, size, and depth (the oscillations being, of course, caused by the tide-generating forces), Harris concludes that the results obtained will apply to similar areas in the various oceans; and he submits a chart of the world, showing the hypothetical no-tide positions of the resulting oscillating systems. He claims that, the tides being due to vibrating motions of more or less definite areas, these positions agree fairly well with the actual tidal observations—which are, of course, confined to the various coasts and outlying islands, no data being at hand for drawing co-tidal lines or determining the range of the tide in the middle of an ocean. Harris's co-tidal lines differ, of course, from those shown on Darwin's chart; and, until we have more information as to the times of high water at full and change at most of the outlying islands, it is impossible to say which map is correct. So far as the coast of Australia is concerned, both maps are in error; and it is regrettable that, while such an enormous amount of labour and mathematical ability was being put into this very important work, more care was not taken to compile well-known facts more accurately. A careful investigation appears to show that at least some of the errors are due to accepting the establishments of some ports without local knowledge—or, perhaps, without due regard to the position of the tide-gauges at those ports. The time of high water, full, and change, inside any large estuary having a narrow entrance is often several hours later than the establishment at the entrance; so that, if this difference is not given on the chart (and it very rarely is), the compiler of co-tidal lines is naturally led astray. The lines shown by Harris on the Australian coast are more nearly cor-

rect than Darwin's, but are still far from accurate.

Eastern Tides.—The eastern coast of Australia is fairly meridional, and is more than 7000 miles away from the nearest large land-surface mass to the eastward. Thus the direction of the tidal wave is approximately normal to the coast, and it is high water at about the same time at all ports from Gabo Island in Victoria to the outer edge of the Barrier Reef near Cape York. The spring rise is about 5½ feet, the neaps rise 3½ feet, and at full and change of the moon it is high water at about 10 hrs. 30 min. (Greenwich time). In the attached table different hours are given for the establishment of some ports, as well as different ranges of the tide; but this is attributable to local conditions, and to the position of the tide-gauges in each case. All ports north of Great Sandy Cape are within the Barrier Reef, in which the channels are of various widths and depths, so that the times given for high water, full and change, are always later than those outside. The tidal streams rush with great strength through the narrow openings of the Barrier Reef, from four to six knots being sometimes experienced. Inside the reef the set of the tides is governed entirely by the configuration of the land and the depths of the channels. On the broken and deeply indented portion of the coast between Great Sandy Cape and the southern end of the reef the streams due to the tides are irregular, the flow setting generally through the westward and northward openings, and the ebb in the opposite direction.

Northward of Port Denison up to Cape Melville, the flood-stream sets generally to the northward, and the ebb to the southward; but the movements are much influenced by the SE. and NW. monsoonal winds. During the rainy season the streams due to tides are more or less modified by the large volume of fresh water discharged from rivers. It is, in fact, not possible to apply to places within the reef the ordinary methods of finding time and height of high and low water, as so many disturbing elements render the problem very complicated and uncertain. A modified arrangement of the method of harmonic analysis was expressly devised by Sir G. H. Darwin, to enable that method to be applied to cases where observations of high and low water only have been recorded. Tables for Cairns harbour, calculated by means of this arrangement, are given in *The Australia Directory*, vol. ii (sixth edition, 1907); and it has been found that the agreement between the predicted and observed times and heights is very satisfactory. On the eastern coast there are no bays, gulfs, or bights large enough to cause sufficient indraught to affect the mariner.

Northern tides.—The tidal movements in the Gulf of Carpentaria, due to astronomical causes, are so small and withal so complicated that they may be described as negligible, the rise and fall being due almost entirely to seiche movements. In the vicinity of 13° S. there appears to be a nodal line at which no vertical movement is perceptible; at the entrance and at the head of the gulf the range approximates nine feet.

Between Cape Wessel and Cape Van Diemen the general set of the tidal stream is from the northward, passing round the Aru and Tenimber groups. In the passage through Dampier Strait at the northern end of New Guinea, and between Way Gui and Gilolo islands, so many obstructions are encountered that the velocity of the stream is considerably modified; when it reaches the Australian coast it is so sluggish that the wind takes complete control, and it becomes impossible, with the very meagre information available, to predict its movements. At St. Asaph Bay on Melville Island it is high water, full and change, 2½ hours earlier than at Port Essington, which is about 100 miles to the eastward; whereas at Liverpool River, about 135 miles farther E., it is high water, full and change, only 30 minutes later than at St. Asaph Bay. At Cape Arnhem, 170 miles still farther E., the establishment is two hours later than at Liverpool River, and only 2½ hours later than St. Asaph Bay. The general rise of spring tides on this portion of the coast is from 6 to 14 feet.

North-western tides.—From Cape Van Diemen the general trend of the coast is south-westerly as far as North-west Cape in 21° 47′ S. Between Cape Van Diemen and Lagrange Bay (near the northern end of Ninety Mile Beach) the tidal range is greater than on any other part of the Australian coast. The least spring range is 21 feet at Adele Island (in 15° 31½′ S.), and the greatest is 36 feet at Collier Bay (in 16° 10′ S.), only eight miles away. The greatest range so far recorded on the Australian coast is at Hanover Bay (in 15° 15′ S.), where the tide rises 38 feet—but this is mainly due to local circumstances. The intermediate ranges are noted in the accompanying table. Between Lagrange Bay and North-west Cape the average range over 11 stations amounts to 14½ feet, with a minimum of eight feet at the latter place and a maximum of 19 feet at the former. It is high water, full and change, at Cape Londonderry and at North-west Cape at the same time, and there is not more than half an hour's difference at any intermediate station. The reason for this abnormally high range over this comparatively short length of coast-line cannot be given with any confidence until more detailed hydrographical surveys are made. The abrupt change in the establishment to N. and S. of Cape Londonderry suggests a different origin for the two tidal streams, whose confluence may cause a heaping-up of the water over the area referred to. Another difficulty arises in determining the origin of the wave which causes high water at the same time at Cape Londonderry and North-west Cape.

Western and Southern tides.—From North-west Cape to Cape Leeuwin the coast trends slightly E. of S., and thence generally ENE. to the head of the Australian Bight and SSE. to Bass Strait. Over the whole of this enormous length of coast-line it is high water, full and change, between the hours of two and four o'clock (Greenwich time), and this fact does not fit in with any known theory of tidal phenomena. The adoption of the theory of separate oscillating systems, as propounded by Harris, would require at least three independent vibrating zones; and there is not room in the adjacent oceans for three such systems.

Tasmanian tides.—These have their origin in the great tidal wave which has been referred to as meeting the eastern coast of Australia and causing high water at about the same time between Gabo Island and Cape York. The establishment is about 1¾ hours later than on the Australian coast, and the spring rise is irregular, being about three feet at Georges Bay, and 10 feet at Flinders Island only 70 miles away. On the northern coast the local configuration of the level in Bass Strait causes tidal currents and irregularities; and on the western

TIDES ON THE AUSTRALIAN COAST.

Place.	Latitude South.	Establishment.	Range. Spring.	Range. Neaps.	Remarks.
	deg. min	h. m.	ft.	ft.	
East Coast—Gabo Island to Cape York.					
Gabo Island	37 35	8 50	6	...	
Ulladulla Harbour	35 22	8 30	6	3½	
Port Jackson	33 52	8 38	5½	3½	
South Solitary Island	30 12	8 30	5	3½	
Danger Point	28 10	8 30	6	4	
Hook Point	25 46	8 30	6	...	
Sandy Cape	24 40	8 50	6–8	...	
Bundaberg	24 51	9 30	8–9	3–4	At South Head.
Lady Elliot Islet	24 5	9 00	7–8	...	
Port Clinton	22 31	10 25	11–15	12	
Roundish Island	21 57	11 50	23–28	15–20	
Thomas Island	20 33	11 5	21	...	
Bowen	20 1	10 20	8–10	6–8	
Townsville	19 14	9 25	8–12	4–8	
Mourilyan Harbour	17 34	9 00	8–10	5–7	
Snapper Island	16 17	9 00	8½	5½	
Flinders Islands	14 10	9 2	11	7	One tide only in 24 hours at neaps.
Cape Weymouth	12 38	9 10	7–9	6½	
Cape Grenville	11 58	9 15	10	...	
Raine Island	11 34	8 10	10	...	
Wallis Islands	10 53	...	7	...	Irregular; sometimes one tide only in 24 hours.
Thursday Island	10 40	12 00	10	6	
Jervis Island	10 14	12 00	...	...	
Gulf of Carpentaria.					
Coen River entrance	13 3	4 00	...	...	
Van Diemen Inlet	16 58	6 45	9	...	Duration of tidal streams, 12 hours.
Norman River	17 30	7 15	13–8	3–4	
Albert River	17 40	8 0	11½–13	...	NW. monsoons.
			8–9	...	SE. monsoons.
Sir Edward Pellew Island	15 40	7 30	4–7	...	Very irregular.
Limmen Bight	14 40	...	Two tides per day		Rise and fall almost imperceptible.
Blue Mud Bay	13 3	...	One tide per day		
Melville Bay	12 0	7 00	8	...	
Malay Road	11 50	8 10	10	...	
Arnhem Bay	12 20	8 00	7	...	
North Coast—Cape Stewart to Melville Island.					
	Longitude East.				
Cape Stewart	134 51	7 30	11	...	
Liverpool River	134 10	6 30	12	...	
Goulburn Islands	133 25	6 00	6	...	
Mount Norris Bay	132 45	6 0	6	...	
Port Essington	132 10	3 24	13	...	
St. Asaph Bay	130 19	5 45	14	...	Melville Island.
North-west Coast—Port Darwin to North-west Cape.					
Port Darwin	130 50	4 00	16½	12¾	
Daly River	131 12	5 00	20	15	
Victoria River	131 0	7 15	24	15	
Troughton Island	126 8	11 30	21	13½	
Sandy Island—Scott Reef	121 48	11 00	13	...	
Prince Frederick Harbour	125 30	12 00	28	...	

Place.	Longitude East.	Establishment.	Range. Spring.	Range. Neaps.	Remarks.
	deg. min	h. m.	ft.	ft.	
North-west Coast—Port Darwin to North-west Cape.—*continued.*					
Port Nelson	125 00	11 45	30	...	
Hanover Bay	124 38	11 30	38	...	
Doubtful Bay	124 30	9 00	36	...	
Buccaneer Archipelago	123 20	0 15	27	3–17	
Port Usborne	123 33	1 45	34	...	
Lagrange Bay	121 48	10 40	28	8	
Port Hedland	118 35	11 00	19	12	Equinoctial rise, 22–24 feet.
Dampier Archipelago	116 40	10 30	16–17	...	
Trimouille Island	115 31	10 30	10	6	
North-west Cape	114 6	10 37	8	...	
West Coast—Port Cloates to Cape Leeuwin.					
	Latitude South.				
Port Cloates	22 41	10 41	5¾	3½	
Gascoyne Road	24 41	10 15	5	...	
Hamelin Pool	26 10	5 0	3½	...	
Houtman Rocks	28 30	11 30	2½	...	
Fremantle Harbour	32 2	8 50	2	...	Irregular.
Busselton	33 41	9 29	2¼	...	
Hamelin Bay	34 15	9 49	2¾	2	
South Coast—Cape Leeuwin to Gabo Island.					
	Longitude East.				
Flinders Bay	115 15	10 35	2¾	2	
Albany	117 55	11 03	2¾	2	
Esperance Bay	121 54	0 10	3–4	2–3	Irregular.
Port Eyre	132 27	12 00	5½	...	
Denial Bay	133 35	0 50	7	...	
Venus Bay	134 35	1 30	4–5	...	
Coffin Bay	135 20	0 45	6	...	
Boston Bay	135 57	1 50	6	...	
Salt Creek Cove	136 10	3 30	6	...	
Hardwicke Bay	137 22	2 45	4–6	...	
Port Pirie Entrance	...	6 45 a.m. / 8 30 p.m.	9½	...	Spencer Gulf.
Port Alfred	137 54	4 37	8	5–6	
Rivoli Bay	140 4	0 33	4	...	
Warrnambool Harbour	142 31	0 37	3	...	
Cape Otway	143 32	0 45	3	...	
Western Port	145 5	1 00	10	8	
Port Albert	146 42	12 00	8	...	
Gabo Island	149 55	8 50	6	...	
Tasmanian Coast					
Macquarie Harbour	145 22	7 30	3	...	Irregular.
Hobart	147 21	8 15	4½	3½	
Georges Bay	148 22	9 42	3	2	
Flinders Island	148 00	10 30	10	...	
King Island	144 00	0 48	3	..	Irregular.

coast the meeting of two streams, one from the north and the other from the south, accounts for unsymmetrical tides at Macquarie Harbour.

G.H.H.

Tiger Shark (*Galeocerdo arcticus*), one of the most dangerous sharks on the Australian coasts. It attains a length of at least 16 feet, is widely distributed throughout temperate and tropical seas, and often appears in harbours and estuaries. The teeth are coarsely serrated, with an up-standing central cusp, and are admirably adapted for cutting and tearing flesh. The tiger shark is an omnivorous feeder, and the stomach contents of a specimen captured near Sydney comprised the undamaged body of a full-grown spaniel, a small porpoise, remains of sea-birds, and a mass of more or less digested fish, including even the spines of a large porcupine-fish. It is bluish-gray above, lighter below, with the characteristic dark spots and bars from which the species takes its vernacular name.

A.R.McC.

Tiliaceae, a large family of trees and shrubs (rarely herbs), chiefly tropical or subtropical. The genus *Grewia* has 10 species indigenous to Australia. *G. polygama* (Plain Currant), an erect shrub with yellow flowers

Plain Currant, and fruit.

and a succulent fruit, is the 'karoom' of the Rockhampton blacks. Leichhardt, when travelling along the Mitchell River, 'found a great quantity of ripe *Grewia* seeds, and, on eating many of them, it struck me that their slightly acidulous taste, if imparted to water, would make a very good drink; I therefore gathered as many as I could, and boiled them for about an hour; the beverage which they produced was at all events the best we had tasted on our expedition: and my companions were busy the whole afternoon in gathering and boiling the seeds.' (*Overland Journey*, p. 295.)

Timaliidae. See BABBLERS.

Timber-borers. See BEETLES, MOLLUSCA, and WOOD-BORERS.

Timbers. The forest trees of Australia are, like the rest of its flora, in many ways sharply distinguished from those in other parts of the world. The number of species is by no means great when compared with that of some of the island groups in the Pacific. The Philippines, for instance, have about 2000 tree-species, the United States and Canada scarcely 700. On a rough computation, Australia has fewer than 500, but this does not imply a scarcity of timber, since individual tree-species range over immense areas—the Murray Red Gum (*Eucalyptus rostrata*), for example, extends over the interior of Queensland, New South Wales, Victoria, and South Australia. The genus *Eucalyptus* is the predominant timber-yielder; its described species exceed 300, among which will probably be found a greater diversity of timbers than in any other genus in the world. What is of more importance, however, is that most Australian trees are timber-yielding, the chief exception being the mallees (small whip-stick stems a few feet high), only a few of which have any commercial value. By reason of the many thousands of square miles covered with *Eucalyptus*, Australia has probably the greatest variety of hardwoods in the world.

In the coastal brushes many fine timber-trees are found, among them Teak (*Flindersia australis*), Red Ash (*Alphitonia excelsa*), and species of the large genus *Acacia*—which yields some of the hardest woods, e.g. Myall (*A. pendula*) and Gidgee (*A. Cambagei*), and some of the most decorative, such as Blackwood (*A. melanoxylon*), Eumung (*A. salicina*), and Hickory (*A. Bakeri*). But in any account of Australian trees the eucalypts must occupy by far the greatest space. In rapidity of growth they have considerable advantage over most exotic hardwoods—the English oak, for instance, will not make as much wood in 200 years as an Australian eucalypt (say *Eucalyptus globulus*) in 24. A wide range of colours, from dark to pale red, pink, gray, chocolate, yellow, and pale yellow—some almost colourless—make Australian timbers adaptable to any branch of industry in which a colour-scheme is desirable. Decorative figures are especially pronounced among the Proteaceae, Casuarinaceae (these two families have the 'oak' grain—hence their common names 'silky oak,' 'she-oak,' etc.), acacias, and eucalypts (which often have a singular figure—known as fiddleback—produced by short undulations of the fibres). The commonest eucalypt figure, however, is that of the satin-wood, and probably the most elegant that of the blackwood. As regards weight, Australian timbers range from the extremely light—e.g. the Nettle-tree (*Laportea gigas*), which weighs 13 lb. per cubic foot (air-dried)—to the ironbarks (which run to over 70 lb.) and some of the heavier acacias, which go up to 80 lb. and over.

Another important physical property is hardness. The result of tests for hardness in nearly 300 species, carried out by R. T. Baker, are published in *Hardwoods of Australia*. The classification used is: (*a*) *extremely hard*, e.g. Axe-breaker (*Geijera Muelleri*) and Gidgee (*Acacia*

Cambagei); (*b*) *very hard*, e.g. Gray Ironbark (*Eucalyptus paniculata*) and Slaty Gum (*E. Dawsoni*); (*c*) *hard*, e.g. Teak and Sydney Blue Gum (*E. saligna*); (*d*) *moderately hard*, e.g. Long Jack (*Flindersia Oxleyana*) and Tasmanian Myrtle (*Nothofagus Cunninghami*). Most Australian timbers come within this classification.

Of softwoods perhaps the most valuable is Red Cedar (*Cedrela Toona*), the first timber to be used for cabinet-work in Australia. It has a deep red colour, is specifically light, open-grained, and easily worked or dressed, takes a beautiful polish, and often has a most decorative figure. Probably no finer carving-timber exists, and its lightness and comparative strength rank it above all others for the manufacture of flying-machines. The next best cabinent-timber is blackwood, famous for its large, wavy and fiddleback figuring. It is fairly close-grained, strong, specifically light, and dresses with a beautiful finish; it is extensively used for furniture and decorative work, and for the fittings of railway-carriages, offices, banks, and shops. Another softwood is *Araucaria Cunninghami* (known vernacularly as hoop pine, colonial pine, Richmond River pine, Dorrigo pine, Queensland pine, and Maryborough pine); it is pale-yellowish in colour, light in weight and free in working, and is used extensively in joinery, general carpentry, and the cheaper kinds of cabinet-work. Other softwood cabinet-timbers that come into the market are, (*a*) *red*:—Queensland Maple (*Flindersia Chatawaiana*), Rosewood (*Dysoxylon Fraserianium*), Red Bean (*D. Muelleri*), Crowsfoot Elm (*Tarrietia argyrodendron*), Silky Oak (*Grevillea robusta* and *Orites excelsa*), Coachwood (*Ceratopetalum apetalum*), Tasmanian myrtle, Maiden's Blush (*Echinocarpus australis*), She-beech or Bolly Gum (*Tetranthera reticulata*), and Onion-wood (*Owenia cepiodora*); (*b*) *pale*:—White Cedar (*Melia Azedarach*), Blue Fig (*Elaeocarpus grandis*), Long Jack, White Ash (*Flindersia Schottiana*), Sassafras (*Doryphora sassafras*), Brown Pine (*Podocarpus elata*), Celery-top Pine (*Phyllocladus rhomboidalis*), Huon Pine (*Dacrydium Franklini*), King William Pine (*Athrotaxis selaginoides*), and Queensland Kauri (*Agathis robusta*). All these are useful in different kinds of cabinet and joinery work. The list is not exhaustive.

Hardwoods used by the cabinet-maker are:—Jarrah (*Eucalyptus marginata*), Spotted Gum (*E. maculata*), Southern Mountain Ash (*E. Delegatensis*), Tasmanian Stringy-bark (*E. obliqua*), Black Bean (*Castanospermum australe*), several species of silky oak and other proteaceous timbers, myall, hickory, gidgee, and many acacias.

Eucalypt timbers.—Most eucalypt timbers are milled and sold under the trade name of 'hardwood,' except those with well-known common names, such as ironbark, spotted gum, tallow-wood, mahogany, blue gum, jarrah, karri, mountain ash, box, red gum, and stringy-bark. *Ironbarks* (a very characteristic group of trees) derive the name from their thick, compact, hard, deeply-furrowed bark, which is thickly impregnated with kino. The wood is heavy, hard, close-grained, and often interlocked. Ironbark timber is utilized for sleepers, telegraph-poles, piles for wharves, bridges, beams and posts in large warehouses and business premises; in case of fire it does not expand or buckle like iron girders. Important business premises in Australia have been completely gutted by fire, yet —ironbark girders and posts having been used in the construction—the outer walls have remained intact, so that it has been necessary only to rebuild the interior. In Australia ironbark sleepers have a life of from 25 to 30 years; posts in the ground last almost indefinitely, and timber taken from buildings over 100 years old has shown no sign of decay. The principal species are Narrow-leaved Ironbark (*Eucalyptus crebra*), Broad-leaved Ironbark (*E. siderophloia*), Gray, White, or Black Ironbark (*E. paniculata*), and Bloodwood Ironbark (*E. Fergusoni*). All except *E. paniculata* have red timbers.

The *tallow-woods* (the name is derived from the greasy feel of the timber) include two species, *E. microcorys* and *E. Planchoniana*, both found in New South Wales and Queensland; both are excellent timbers, very hard, close-grained, and heavy; they are suitable for heavy constructional work, for goods-trucks, and wherever strength is required.

Eucalypts with a smooth bark are usually spoken of as *gums*; among them are found a variety of timbers differing in colour, texture, durability, and weight; as hardwoods their value is very variable. For convenience of identification the timbers may be divided into pale, red, and light or dark brown. The more important commercially are; *pale*:—Tasmanian blue gum, used mostly for wharfing; spotted gum, a splendid timber for carriage- and coach-building, which also makes up well for furniture; Giant Gum (*E. regnans*), similar in texture to English and American ashes, and just as useful; *E. goniocalyx*, and Citron-scented Gum (*E. maculata* var. *citriodora*); *red*:—Sydney blue gum, suitable more particularly for felloes; Gray Gum (*E. propinqua*), a splendid all-round timber; Manna Gum (*E. viminalis*) and slaty gum, equal to ironbark for general building-purposes; Gray Gum (*E. punctata*), Wandoo (*E. redunca*), Salmon Gum (*E. Salmonophloia*), Forest Red Gum (*E. tereticornis*), and Murray red gum.

The English name '*ash*' aptly describes the nature and uses of the eucalypt timbers to which it is applied. Under Mountain Ash are reckoned *E. oreades* (the *E. altior* of Maiden), *E. Delegatensis*, *E. Sieberiana*, which has rather the texture of the harder, close-grained stringy-barks, and *E. fraxinoides*.

One of the largest groups of eucalypts is the *stringy-barks*. Their timber is fairly uniform in colour and texture, so that, especially in the superior kinds, there is a difficulty in differentiating the species. The best are White Stringy-bark (*E. eugenioides*), Narrow-leaved Stringy-bark (*E. Wilkinsoniana*—*E. laevopinea* var. *minor* of Maiden), Silver-top Stringy-bark (*E. laevopinea*), Yellow Stringy-bark (*E. Muelleriana*), *E. dextropinea* (the *E. Muelleriana* of Maiden), and *E. fastigata*. Brown Stringy-bark (*E. capitellata*) and Red Stringy-bark (*E. macrorhyncha*) are inferior to the others, although useful for many purposes. *E. obliqua* has more the colour of the true oak (*Quercus*) and so is made into furniture; but care must be taken to remove the sapwood, which is readily attacked by 'borers' (see WOOD-BORERS). All the stringy-barks may be used for general building-purposes, carriage construction, shipbuilding, and also for sleepers and telegraph-poles, being very durable in the ground.

The well-defined '*peppermint*' group of eucalypts is found in the coastal districts of New South Wales and throughout Victoria and Tasmania. The wood much resembles that of the stringy-barks, but is inferior, gum-veins being more prevalent. The trees are easily recog-

nized by the characteristic felted bark; the common name is derived from the presence in the leaves of a peppermint ketone (piperitone), to which constituent the odour of the essential oil of the leaves is due. The principal species are Sydney Peppermint (*E. piperita*), which received the name 'peppermint' from the earliest settlers in 1788; Messmate (*E. amygdalina*), *E. phellandra* (the *E. radiata* of Maiden), and *E. vitrea*.

The name '*mahogany*' was applied by the early settlers to eucalypts which were supposed to resemble the mahogany of commerce (*Swietenia Mahogani*); the likeness is only in colour, for Australian 'mahogany' is much heavier, closer-grained, harder, and more durable, but (with the exception of jarrah) it is not at all inferior as cabinet timber. The principal species are:—Red Mahogany (*E. resinifera*), Swamp Mahogany (*E. robusta*), Jarrah, Karri (*E. diversicolor*), Woollybutt (*E. longifolia*), Australian Mahogany (*E. patentinervis*—the *E. Kirtoniana* of Mueller), and White Mahogany (of two kinds *E. acmenioides* and *E. umbra*). They are all excellent hardwoods, and are used for general building-purposes, bridgework, railway rolling stock, and other constructions requiring hard, strong, durable woods.

Blackbutts resemble the stringy-barks in colour, texture, and durability, and are put to the same industrial uses. *E. pilularis* is the most widely distributed, being found on the tablelands of Victoria, New South Wales, and Queensland; *E. patens* is restricted to Western Australia, where also are found *E. Dundasi* and *E. Cle'andi*; *E. Cambageana* is indigenous to Queensland.

Boxes have a wide geographical range in eastern Australia, and comprise a fairly large number of species. The colour varies, perhaps, more than that of any other group. The wood is characteristic, being very hard and heavy, close-grained, and often with interlocked fibres. It brings the highest price in the market as firewood, but deserves to be put to a better use. Nearly all box timbers are excellent for heavy constructional work (such as bridges and wharves), sleepers, fencing-posts, wheelwrights' work, mallets, mauls, etc. They may be divided into two classes:—(*a*) *pale*, including White Box (*E. albens*), Fuzzy Box (*E. conica*), River Box (*E. Fletcheri*—*E. Baueriana* of Maiden), Gray Box (*E. hemiphloia* and *E. quadrangulata*), Thozet's Box (*E. Ravertiana*), Yellow Box (*E. melliodora*), Mallee Box (*E. Woollsiana*), Box (*E. odorata*), and Tuart (*E. gomphocephala*); (*b*) *red*, including Red Box (*E. Bosistoana*), Red Box (*E. largiflorens*—the *E. bicolor* of Cunningham), Coolabah (*E. microtheca*), Red Box (*E. polyanthemos*), Coast Red Box (*E. Rudderi*), Bimbil Box (*E. populifolia*), *E. affinis* and Box Tree (*E. Browni*).

Of the few *woollybutts* only one (*E. longifolia*) is valued for its timber, and this is described under the mahoganies. The most famous of all is Camden Woollybutt (*E. Macarthuri*), which is valued more for the essential oil of the leaves than for its timber.

Bloodwoods are easy of determination; they possess a very open, coarse grain much impregnated with kino in veins known as gum-veins. They vary in colour from deep red (*E. corymbosa*) through lighter red (*E. intermedia*) and pale (*E. calophylla*) to almost white (*E. eximia*); all are durable in the ground, tough, hard, and heavy. The principal species, besides those above mentioned, are Carbeen (*E. tessellaris*), *E. trachyphloia*, *E. terminalis*, and *E. Albergiana*.

Other Hardwoods.—The eucalypts by no means exhaust Australia's list of hardwoods, which may be classified into (*a*) those regularly marketed, and (*b*) those rarely so. Among the latter are many excellent timbers. Some have been already mentioned; among others occasionally found in commerce are Ironwood (*Geijera salicifolia*), an exceedingly hard, close-grained, heavy, pale-yellowish timber; Thorny Yellow-wood (*Zanthoxylum brachyacanthum*)—the yellow in this is more pronounced than in that of any other Australian wood; Scrub Hickory (*Pentaceras australis*), a splendid timber possessing the qualities of English hornbeam, and New South Wales Maple (*Villaresia Moorei*), a splendid furniture-wood equal to the English beech, which it much resembles, although when cut on the quarter it has more of an oak figure. Species of *Flindersia*—*F. australis* (Teak), *F. Oxleyana* (Long Jack), *F. Schottiana* (White Ash), *F. Bennettiana* (She-teak), *F. maculosa* (Leopard Tree), and *F. Ifflaiana* (Cairns Hickory)—are excellent hardwoods, the lightest in weight being long jack. Among the Sapindaceae the best-known timbers are Tulip-wood (*Harpullia pendula*) and Brush Teak (*Ratonia tenax*). The Anacardiaceae produce one very good timber, Yellow Cedar (*Rhodosphaera rhodanthema*). The Myrtaceae include a number of non-eucalypt commercial timbers, such as *Tristania conferta* (Brush Box), a tree much used for street decoration, which yields a timber useful for rough structures; it also makes the best large-sized wedges for ship-launching. The turpentines (*Syncarpia*) are famous timber-producers, the most important being *S. laurifolia*, which, thanks to a layer of resin below the bark, resists the attacks of *Teredo* and is the most durable of all for wharf-piles. Other fine myrtle timbers are found in the brushes, but rarely come on the market.

Black Apple (*Sideroxylon australe*), of the Sapotaceae, has a fine timber, hard, heavy, close-grained, much resembling English box, for which it would be an excellent substitute. Of the Ebenaceae, Gray Plum (*Diospyros* or *Cargillea pentamera*) is well known, being one of the best timbers for golf-club shafts. One of the giants of the Myoporaceae is Budda or Bastard Sandalwood (*Eremophila Mitchelli*). The Lauraceae provide some splendid timber, little known commercially—except, perhaps, She-beech (*Beilschmiedia obtusifolia*); the *Cryptocarya* species are more valuable, especially the Queensland Walnut (*C. Palmerstoni*).

The Proteaceae include excellent hardwoods, as well as a few softwoods. They are all characterized by large, pronounced medullary rays which give them an oak-figure, and so can all be classed as cabinet-woods, although used in other trades. The hardest are Beefwood (*Grevillea striata*), Queensland Nut (*Macadamia ternifolia*), Red Silky Oak (*G. Hilliana*), Bull Silky Oak (*Cardwellia sublimis*), and species of *Hakea*; the lighter ones are Silky Oak (*G. robusta* and *Orites excelsa*) and Satin Silky Oak (*Embothrium Wickhami*). Some of the very best hardwoods are Euphorbiaceae—for instance, Brush Ironbark (*Bridelia exaltata*), Yellow Tulip (*Hemicyclia australasica*), a teak (*Dissiliaria baloghioides*), Kamala (*Mallotus philippinensis*), and Brush Bloodwood (*Baloghia lucida*). The Casuarinaceae, well represented in Australia, have (like the Proteaceae) very marked medullary rays, and so the name 'oak' is ap-

plied to all the species except Belah or Belar (*Casuarina Cambagei*—the *C. lepidophloia* of Mueller). They are all hard, heavy woods, very durable and very decorative in figure; the principal species are Swamp Oak (*C. glauca*), Bull Oak (*C. Luehmanni*), Forest Oak (*C. torulosa* and *C. suberosa*), and River Oak (*C. Cunninghami*). Among the Cupuliferae *Nothofagus Cunninghami*, though hardly ranking as a hardwood, is yet a first-class commercial wood, red in colour, fairly light in weight, very durable in the ground and used for many purposes.

The *conifers* or *pines* are not commercially well represented in Australia, but Tasmania has some good species. Botanically there are no pines in the Commonwealth, for botanists restrict that name to the genus *Pinus*, of which there are no representatives here. The name, however, has been applied to almost every species of conifer in Australia, and will probably stand for all time. The most extensively distributed of them all are the cypress pines, which occur in isolated patches on the east coast and extend over thousands of acres right across the continent into Western Australia. The wood of the White and Black Pine (*Callitris glauca* and *C. calcarata*)—the two inland species—is extensively used in house-building, having the reputation of being white-ant-proof. Hoop pine has already been mentioned. Huon pine is an excellent timber, yellowish in colour, close-grained, and useful for cabinet and other work. King William pine is a beautiful, even-grained wood, in this respect equal to any other wood for violin-making, and its congener the celery-top pine is of equal merit. Brown Pine (*Podocarpus elata*) is highly valuable among the softwoods; Queensland kauri is perhaps heavier than the New Zealand kauri, but otherwise is quite equal to it in commercial value.

Trade uses of Australian and Tasmanian timbers:—

Beams—Ironbarks, tallow-wood, jarrah, teak.

Bending—Spotted gum, mountain ashes (*E. fraxinoides, E. Delegatensis, E. oreades, E. regnans*), long jack, silky oaks (*Grevillea robusta, Orites excelsa*), beech, Tasmanian myrtle, blackwood.

Boat-building—see SHIPBUILDING.

Bridges—Almost any hardwoods procurable in the neighbourhood.

Broom-handles—Any of the mountain ashes mentioned above, also *E. regnans* and *E. viminalis*, hoop pine, brown pine, sassafras, blue fig (*Elaeocarpus grandis*), long jack.

Buildings—Almost any hardwood, ironbarks for girders and columns; do not use hardwoods for rafters. For weatherboards, any of the eucalypt red woods.

Cabinet and furniture—Blackwood, jarrah, black bean, Sydney blue gum, crowsfoot elm, silky oaks, spotted gum, mountain ashes (as above), Queensland and New South Wales maple.

Carriage- and coach-building—constructional:—mountain ashes, spotted gum, jarrah, forest gum, gray gum, tuart, blackbutt, York gum, stringy-barks; *decorative*:—blackwood, silky oaks, crowsfoot elm, New South Wales maple, hickory (*Acacia Bakeri*), tea-trees, fire tree, cedar, Huon pine, figured eucalypts, coachwood, any of the fiddleback timbers.

Carving—The palest of the stringy-barks (which are superior to English oak for this purpose), Sydney blue gum, jarrah, *Pittosporum*, Rutaceae, black apple. The best of all is the red cedar, but it is difficult to get now.

Cooperage—Long jack, blackwood, southern mountain ashes, silky oak.

Dray-poles—Ironbarks, tallow-woods, spotted gum, citron-scented gum, jarrah, tuart, wandoo, morrell (*E. oleosa* var. *longicornis*), teak, Cairns hickory.

Felloes—Sydney blue gum, forest red gum, ironbark (in heavy drays), gray gum, jarrah, spotted gum.

Flooring—Among hardwoods jarrah and tallow-wood (especially for dancing-floors), but not spotted gum unless free of sapwood; Tasmanian myrtle.

Girders—Ironbark, tallow-wood, teak.

Gunstocks—Blackwood, tea-tree, Queensland walnut.

Golf-clubs—heads:—Mararie (*Weinmannia lachnocarpa*), tea-tree, gray myrtle, water gum, native cherry, *Pittosporum*; *shafts*:—spotted gum, giant gum, mountain ashes, long jack, scrub hickory.

Handles—axe:—Mountain ashes, spotted gum, blue gum (*E. globulus*), carbeen, teak, hickory (*A. Bakeri*); *tools*:—morrell, box, brush box, water gum, gray myrtle, axe-breaker, tulip-wood, myall, gray mangrove, belah, tea-tree, bottle-brush.

Mallets—Morrell, brush box, water gum, tulip-wood, gray mangrove, mararie, bottle-brush.

Naves—Iron-bark, tallow-wood, gray mangrove.

Oars—Southern mountain ashes.

Planes—Native beech, mararie, New South Wales maple, tea-tree, beefwood, myrtle.

Shafts—light:—spotted gum, southern mountain ashes, manna or ribbon gum, karri, tuart, yate (*E. cornuta*), morrell, long jack; *heavy*:—tallow-wood, ironbarks.

Spokes—light:—spotted gum, ribbon or manna gum, southern mountain ashes, stringy-barks, karri, York gum, yate, blackbutt; *heavy*:—ironbark, tallow-wood, tuart, wandoo.

Telegraph-poles—Ironbark, tallow-wood, blackbutt.

Wharves—piles:—turpentine with the bark on (see previous reference to this wood), ironbark; *decking*:—any of the hardest of the eucalypts.

See J. E. Brown's *Forest Flora of South Australia* (1882) and 'Forest Resources of Western Australia' in the Western Australian *Year Book* (1905); W. H. Warren's *The Strength and Elasticity of New South Wales Timbers of Commercial Value* (Sydney, 1887) and *Australian Timbers* (Sydney, 1892); F. M. Bailey's *Queensland Woods* (Brisbane, 1888); J. H. Maiden's *Forest Flora of New South Wales* (vols. i-viii, 1902-25); P. MacMahon's *Merchantable Timbers of Queensland* (Brisbane, 1905); G. A. Julius's *Physical Characters of Hardwoods of Australia* (Perth, 1907); R. T. Baker's *Cabinet Timbers of Australia* (Sydney, 1913) and *Hardwoods of Australia* (Sydney, 1919).

R.T.B.

Timonius, a tropical genus of the family Rubiaceae, consisting of shrubs. *T. Rumphi* (Kavor-kavor of the aborigines), the one species indigenous to Australia, has a fruit like that of the crab or wild apple of Europe, much appreciated by the blacks of northern Queensland. Its timber is light-coloured, close-grained, easily worked; it takes a good polish, and is considered to resemble that of the English sycamore.

Tin. The chief source of tin is cassiterite, an ore known commercially as tinstone or black tin to distinguish it from metallic or white tin. Theoretically cassiterite contains 78.6 per cent metallic tin, but actually it may contain up to 9 per cent ferric oxide which will reduce this amount. Stannite (a sulphide of tin, copper, and iron) has been mined at Howell, near Tingha in New South Wales, and near Zeehan in Tasmania, and tin associated with tantalum is obtained at Greenbushes in Western Australia.

Tin has been mined from Tasmania in the south to Queensland in the north. In Tasmania it is mined from Heemskirk, on the western coast to Mount Bischoff, and in a large area in the north-east of the island, with Briseis at its centre; finds have also been made at St. Helens and in Flinders and Cape Barren islands. In Victoria it has been mined at Mount Wills, Beechworth, and Eskdale; in New South Wales at Jingellic, at Dora Dora and Pulletop in the western Riverina, Burra Burra and Ard-

lethan in the Lachlan valley, Poolamacca and Euriowie in the Barrier ranges, Inverell, Tingha, Emmaville, Deepwater, Torrington, and other places in the New England district, and in the beach sands of the eastern coast. In Queensland it is mined at Stanthorpe in the south-east, Kangaroo Hills near Townsville, Herberton and Irvinebank near Cairns, at Cooktown, Port Stuart just below Cape York, and at Stanhills near Croydon. Western Australia has fields at Greenbushes in the south-west and Pilbara in the north-west, and deposits are known on the Gascoyne and Murchison and in the Kimberley district. The Northern Territory has an important field at Marranboy near the Katherine River and minor deposits south of Pine Creek.

The first discovery of tin in Australia was made by W. B. Clarke (q.v.), who in the early 1850s reported it from the Darling Downs, in Queensland and New England, and the Kosciusko district in southern New South Wales. In 1871 the Mount Bischoff mine in Tasmania was discovered by James Smith (q.v.), and in the following year deposits were opened up at Inverell in New South Wales and Warwick in southern Queensland—both these discoveries were of 'stream tin.' The Herberton field was opened up in 1879, and the Western Australian fields in 1888. Both alluvial and lode tin are known to exist on King Island in Bass Strait, but so far neither has been worked. Australia reached its maximum production in 1907 (value £1,509,787), in which year Tasmania and Queensland yielded 9500 tons between them. Recently the yield has decreased considerably, mainly because of low prices and high production-costs; the average production-values for 1919-24 are:—New South Wales, £264,806; Tasmania, £253,298; Queensland, £141,317. The much smaller outputs of the other producing States brought the Commonwealth's average up to £717,110. Australia produces about 2.2 per cent of the world's output.

Tin-ore is found in lodes, impregnations, stockworks, or alluvial deposits. Most tin-lodes and formations exist in combination with granite, or in the neighbourhood of acid intrusives in the slate or quartzite formation overlying it. Interesting pipe-formations have been described in New South Wales; they are roughly cylindrical in shape, with diameters varying from 2 to 12 feet, and with a filling of altered stanniferous rock. The most important minerals accompanying tin in the lodes are topaz, tourmaline, apatite, fluorspar, wolframite, scheelite, molybdenite, copper, bismuth, and arsenical ores. In Western Australia niobium and tantalum compounds increase the metallurgical difficulties.

Detrital (secondary) deposits are accumulations of ore formed by the destruction and redeposition of primary deposits, and are at times consolidated with some cementing material, such as oxide of iron, lime, or silica. The associated minerals found in streams may or may not have come from the same source as the tin,

Principal deposits of tin ore.

for streams wear a channel through all sorts of country; and any heavy mineral that finds its way into a watercourse will work its way down to the bottom for the same reason as did the heavy tinstone. Tinstone, from whatever source it is obtained, should be dressed up to from 70 to 75 per cent of metallic tin, because, being an oxide, it would be easily slagged off were the necessary fluxes left behind, and a percentage of tin would be lost thereby. At one time tin used to be smelted at Irvinebank in northern Queensland and on other tin-fields, but now it is dressed at the mines, and the concentrates are either smelted at Sydney or at the Mount Bischoff works at Launceston, where each furnace takes a charge of 4½ tons of concentrates.

Value of tin produced, 1919 to 1925.

Year	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	N. Ter.	Total
	£	£	£	£	£	£	£	£
1919	416,623	17,561	143,167	——	47,269	395,794	30,021	1,050,435
1920	413,794	12,815	252,054	——	49,449	369,362	27,610	1,125,084
1921	163,451	11,961	98,471	——	6,485	130,257	7,793	418,418
1922	154,698	12,071	99,758	——	10,930	112,407	5,891	395,755
1923	180,789	10,371	114,945	——	15,095	236,955	13,887	572,042
1924	259,485	6,056	175,509	——	12,008	275,014	12,855	740,927
1925	250,944	11,592	161,500	——	15,392	297,515	15,966	752,509

Titanium. See MINERALOGY.

Titheradge, GEORGE SUTTON (1853-1916), born at Portsmouth in England in 1853, was destined for an official career, but preferred the stage, and after some experience as an amateur joined the Bath and Bristol circuit—which has been termed 'the finest school of acting of which England has ever been able to boast;' it produced the Terrys, the Robertsons, Marie Wilton (Lady Bancroft), and the Rignolds. From this training-ground Titheradge came to London in the early seventies, made a success there, and then toured India. Being in Calcutta in 1877, he was invited to read at the Durbar the official proclamation of Queen Victoria as Empress of India. Titheradge then came to Australia, where—with the exception of one tour of England in association with Mrs. Patrick Campbell, Marie Tempest, Margaret Anglin, Olga Nethersole, John Hare, and Edward Sothern—he spent the rest of his life. He was at first a leading member of the London Comedy Company (see DRAMA), but it was by his association with the Brough and Boucicault company that he is best remembered. The variety and importance of his rôles were equalled only by the consistent standard of excellence maintained in all of them. The name-part in *The Village Priest*, the Dean in *Dandy Dick*, Aubrey Tanqueray in *The Second Mrs. Tanqueray*, and Partridge in *Tom Jones* may be specially mentioned; but his Benedick in *Much Ado about Nothing* and his Wilfred Denver in *The Silver King* were undoubtedly his best parts. During the last ten years of his life Titheradge lived in retirement, busying himself with his garden—he was a noted and successful grower of daffodils. He died in Sydney on 16 December 1916, the doyen of his profession in Australia. George Titheradge was the father of one son, Dion, the actor-author of New York and London, and of four daughters, of whom Madge Titheradge has attained in England to considerable eminence in her father's profession.

S.E.N.

Tits. See THORNBILLS.

Tivey, EDWIN, was born at Inglewood, Victoria, on 19 September 1866. He entered the militia and in 1889 received a commission in the Victorian rangers (lieutenant, 1889; captain, 1891; major, 1909; lieutenant-colonel, 1911; colonel, 1913; brigadier-general, 1916; major-general, 1918), and served in Australian contingents during the South African war in 1900-2. On 22 July 1915 he was appointed in Australia to organize and command the 8th infantry brigade of the Australian Imperial Force (q.v.), which he accompanied to the front. Arriving in Egypt too late to take part in the Gallipoli campaign, he was given charge of a sub-sector of the Suez Canal defences. Later on, joining with his brigade the 5th Australian division in France, he commanded it in the action near Fromelles on 19 July 1916, through the subsequent winter operations on the Somme, at Bullecourt (1917), Ypres (1917), and throughout the fighting before Amiens (1918). After the armistice, upon the transfer of General Hobbs to control the Australian corps, General Tivey was given command of the 5th division.

C.E.W.B.

Toadoes, a large group of fishes (Tetraodontidae), also known as puffers and globefish, which have the power of inflating themselves by imbibing either air or water until they become more or less globular in form. This peculiar habit is well known to merciless small boys, who tease the unfortunate fish by causing it to distend itself to its utmost, and then jump on it to make it burst with a sharp noise. Larger and more ornate tropical species are skinned and dried in a distended shape, to serve as bizarre lamp-shades. The skin often appears to be naked, but is usually beset with more or less numerous small spines or prickles, which become erect when the fish is inflated and so serve as a protection against enemies. The teeth of toadoes are united into a stout beak-like structure, which enables them to bite off pieces of coral and the calcareous tubes of worms, and to crush young oysters upon which they feed. Although some species are used as food, a large number are known to be highly poisonous, and death has resulted from eating them. A small species (*Spheroides hamiltoni*), very common round Sydney, has killed Chinese who ate it, but a larger representative of the same genus has been pronounced good food by people who cooked it without knowledge of its bad reputation.

A considerable number are known from Australian waters, some species occurring in the shallows of the tropics, others extending to the coldest depths. The former are often strangely ornamented with striking colours and markings; the latter are silvery, or of more sombre hues.

A.R.McC.

Toads. See AMPHIBIA.

Tobacco. From the first days of the settlement tobacco was reckoned a necessity of life, and Major Ross took credit to himself (and gained approval from the admiralty) for having

secured a supply for his marines from the master of a transport. In 1799 so scanty was the supply that the price went up to 24s. per lb. In 1802 Hunter's general report on the colony to the colonial office singles out tobacco 'from the seed which has been carried there' as a suitable crop for the climate, though no farmer seems to have troubled to grow it; Surgeon Luttrell in 1807 repeated the comment, adding that the culture 'has not been attempted, in great measure from the poverty of the settlers, not being able to raise buildings for the drying and curing of it, and from the number of hands necessary in the culture.' In those years the colony drew its supplies chiefly from Brazil.

In 1818 Macquarie imposed a duty of 6d. per lb. on imported tobacco, avowedly to stimulate local industry, and forthwith began to experiment with tobacco-growing at Emu Plains; in July 1821 he sent Lord Bathurst a small tin box of the product, which he declared the convicts preferred to the Brazilian import—Lord Bathurst's opinion has not survived. The farmers' club of Hunter River offered in 1826 a premium of £5 for ten pounds weight of the best tobacco. By Darling's time 'the Manufacture of Tobacco the growth of the Colony into the description called Negro Head' was rapidly superseding the Brazilian product, of which less than £6000 worth was imported; Gregory Blaxland urgently desired a grant of 40,000 acres near Sydney for tobacco-growing, but made the mistake of appealing to the colonial office over Darling's head. In 1830 the industry was so flourishing that growers asked the British government for a preference of two-thirds the duty on New South Wales tobacco imported into England. They had to put up with the general colonial preference of 3d. per lb.

In 1832 766 cwt. of tobacco was grown for export, 1577 cwt. in 1834, and 4952 cwt. in 1838. Notable fluctuations in production between 1840 and 1860 are shown in the following table:—

In 1840	381	acres	yielded 4300	cwt.
1843	665	„	„ 6382	„
1848	201	„	„ 309	„
1851	731	„	„ 12,530	„
1854	8	„	„ 260	„
1856	218	„	„ 2813	„
1860	240	„	„ 9704	„

Before 1860 an era of small factories had begun, and in that year one establishment at Port Stephens, three at Dungog, eight at Maitland, and one each at Petersham and Sydney produced 1697 cwt. between them. The quality was inferior—'dark strong tobacco was in favour.' In the 1880s a remarkable extension of the industry took place, the Australian acreage mounting from 3154 (31,708 cwt.) in 1881 to 6641 (70,251 cwt.) in 1888; but the 1888 crop was far too large for local consumption and not well enough handled for export, so that growers lost heavily and the next year's figures showed only 4194 acres (31,847 cwt.). By 1894 the yield had fallen below that of 1881, and the colonial governments began to see the necessity of stimulating the industry with expert advice. Australian farmers, however, did not care for the amount and kind of labour involved in proper cultivation, and the industry was left almost entirely in the hands of Chinese residents of the upper Macquarie (Bathurst), upper Namoi (Tamworth), and Tumut districts. In 1900 the whole Australian area under tobacco was only 973 acres—199 in New South Wales, 109 in Victoria, and 665 in Queensland.

In Queensland tobacco was grown on an area of 19 acres by Chinese in 1865; in 1888 117 acres were under this crop, and 994 acres in 1896. In 1899, the services of an expert having been obtained from the United States, production increased by 77,571 lb. over that of the previous year. The industry in Queensland is more or less concentrated in the Texas and Inglewood districts and the fertile flats of the Dumaresq River, extending over the border into New South Wales. Cigar-leaf is grown in the Bowen district—the Texas product is a pipe-tobacco. Fluctuations in the area cultivated are as follows:—

1890	..	3239 acres	1905	..	752 acres
1895	..	706 „	1910	..	655 „
1902	..	182 „	1917	..	317 „
		1925 .. 166 acres			

In Victoria also the first tobacco was grown by Chinese. The cultivated area increased steadily from 66 acres in 1859 to 1936 in 1878; fluctuations then began, the maximum being 2031 acres in 1886, the minimum 78 in 1898. In 1897 the Victorian government offered a bonus of 3d. per lb. on locally-grown leaf approved for export, but the conditions were too stringent to encourage the industry, and in 1901 the offer lapsed.

In 1890 a plantation was started at Rumjungle 60 miles from Darwin in the Northern Territory, an expert was brought from India, and for several years tobacco of high quality was exported, some parcels realizing 10s. 9d. per lb.; the industry was abandoned when the original owner died.

There are two main obstacles to the growth of the industry. The chief one is that Australian soil lacks the requisite salts—particularly potash—so that careful manuring is necessary; growers must treat not only curing but growing as a science. The crop further demands close attention at every stage of its growth; it is a 'tricky' crop, largely influenced by the soil in which it is grown—heavy, rich soil produces dark, heavy tobacco, lighter soil, particularly that of goldfield neighbourhoods, produces bright tobacco, and pipe-tobacco must not be grown within range of sea air. Another obstacle is of a different nature. The imported American leaf has been maturing in a vessel's hold for 8 to 12 weeks at a practically constant temperature, thus acquiring a quality that can be imparted to the home-grown leaf only by a similar lengthy maturation prior to manufacture. Australian leaf thus treated has been found equal to the finest American, but Australian growers have hitherto lacked the necessary patience in maturing. Moreover, there is no outside market for sun-cured tobacco (most Australian tobacco is so cured) and, owing to the world-wide combinations in the tobacco trade, there is but a single customer for leaf within the Commonwealth. This company, in order to educate growers in the correct method of handling the leaf, a few years before the war of 1914-18 established farms of its own on a co-operative basis; the outbreak of the war, however, hampered operations severely. An agreement between the company and local growers provided that in 1925-7 the company should purchase a minimum of 1400 tons of flue-cured leaf (700 tons from Victoria, 700 from New South Wales), £3700 to be advanced by the company for the erection of flue-barns, but after the 1925 season no sun-dried leaf to be taken. But the industry is not yet popular, probably because of the danger of the fungus disease known as 'blue mould,' which destroys young plants in the seed-

beds; experiments in progress for the prevention of this disease have so far been hopeful.

The area between Tumut and Wagga in New South Wales, and a southward extension into Victoria, will, experts say, produce the nearest type to the imported American. In Queensland, Texas and the Darling Downs are the most favoured districts. The best soil for tobacco is a loose, friable loam, dry and warm, well-drained, and either naturally or artificially sheltered, with a north-easterly aspect. The land should lie fallow for some months before planting, and be ploughed once in May, then monthly until the planting-season (from July to October). Then the land is subsoiled, and the seed sown in beds and covered against frosts; the seedlings are transplanted, the crop cultivated, hilled, primed, and topped—i.e. the flower-buds (unless grown for seed) and upper leaves are ripped off and the resulting side-shoots removed. When mature, the crop is harvested and cured.

In 1924-5 2149 acres were under tobacco—719 in New South Wales, 1228 in Victoria, 166 in Queensland, and 36 in South Australia. The amount of Australian leaf used in manufacture in the 1923-4 season was 1,122,825 lb.—less than 7 per cent of the total amount used.

F.B.G.

Tobacco, Wild. See NOXIOUS PLANTS.

Todd, SIR CHARLES (1826-1910), born on 7 July 1826 at Islington, London, and educated privately, was in 1841-7 supernumerary computer at Greenwich observatory, and in 1848 became assistant astronomer at the observatory at Cambridge, where he helped to determine the telegraphic distance between Cambridge and Greenwich. In 1854 he was recalled to Greenwich to take charge of the galvanic department, and in 1855 was appointed superintendent of telegraphs for South Australia and director of the Adelaide observatory. He landed in Adelaide on 5 November 1855, and devoted his energies to improving and extending the colony's telegraphic system; a telegraph-line from Adelaide to Port Adelaide was opened in February 1856, and in July 1858 he connected Adelaide and Melbourne. In 1859 he suggested the construction of a line from Adelaide to Port Darwin, and thence to England. In 1869 the colony's postal and telegraphic departments were amalgamated, and in 1870 he became postmaster-general. The line to Port Darwin having been authorized, he supervised the work, and on 22 August 1872 completed it. On 21 October communication with England was established, and banquets were held to celebrate the occasion in Adelaide, Sydney, and England. He next turned his attention to communication with Western Australia and built a 1000-mile line to Eucla, where it joined the western colony's system. In 1889 he was made a fellow of the Royal Society. It is noteworthy that the South Australian legislature refused, so long as Todd was in the service, to pass an act retiring public servants at 70. He retired from public service on 31 December 1906, having been government astronomer for 51 years, and died on 29 January 1910. (C.M.G., 1872; K.C.M.G., 1893.) See ASTRONOMY, OVERLAND TELEGRAPH-LINE, and POSTS AND TELEGRAPHS.

Tommy Rough. See AUSTRALIAN SALMON.

Tompson, CHARLES. See LITERATURE, AUSTRALIAN.

Tongue Pods. See ALBIZZIA.

Topaz. See GEMSTONES and MINERALOGY.

Tope. See SHARKS.

Torbanite. See OIL.

Torpedo, The. See BRENNAN, LOUIS.

Torrens, SIR ROBERT RICHARD (1814-1884), born at Cork in Ireland in 1814, was the son of Colonel Robert Torrens, an original member of the South Australian Land Company of 1831 and of the South Australian Association of 1834 who in 1835 published a book, *Colonization of South Australia,* and in May of that year was made chairman of the colonization commission for the new province. R. R. Torrens was educated at Trinity College, Dublin, was trained for a business career as a clerk in the customs-house, London, and in 1840 migrated to South Australia and was made collector of customs at Adelaide with a seat in the legislative council. On 3 January 1852 he was appointed treasurer and registrar-general, and in 1855 was called to the executive council. Under responsible government he was elected by the city of Adelaide to the legislative assembly, and was treasurer in the first Finniss ministry (24 October 1856 to 21 August 1857). On 1 September 1857 he formed an administration that lasted exactly a month, in which he was premier and colonial secretary and introduced a bill 'to simplify the laws relating to the transfer and encumbrance of freehold and other interest in land.' Three ministries fell before the second reading took place. In June 1858 he resigned his seat in the assembly to become official head of the lands titles department, and in 1860 visited New South Wales and Victoria to explain the working of his measure. When he left for England in 1863, similar measures had been passed in almost every Australian colony. In England he thrice contested an election for Cambridge with a view to introducing his land policy to the British legislature; in 1868 he won the seat, but had no opportunity of introducing a bill. Defeated at the election of 1874, he retired from politics, and died at Falmouth on 31 August 1884. (K.C.M.G., 1872; G.C.M.G., 1884.) See TORRENS SYSTEM.

J.V.C.-B.

Torrens System, a statutory system of registration of title, designed to facilitate and simplify the transfer of land. It derives its name from its originator, Sir Robert Torrens (q.v.), who first outlined his proposals in an address to the electors of Adelaide in January 1857. These were embodied in a bill which was introduced into the legislative assembly of South Australia on 4 June 1857, received assent on 27 January 1858, and came into operation on 1 July 1858. Queensland adopted the system in 1861; New South Wales, Victoria, and Tasmania in 1862; New Zealand in 1870; and Western Australia in 1874.

Conditions were particularly favourable to the introduction of the Torrens system into the Australian colonies. In the oldest of these—New South Wales—only a little over 7,000,000 acres of public lands had been alienated by the crown up to the date (1 January 1863) when the Torrens system came into operation. While these lands continued to be held under the inherited system of common law title (now known as 'the old system'), all crown lands subsequently alienated have been granted under the provisions of the Real Property Act 1862, and up to 31 December 1925 the area so granted amounted to nearly 42,250,000 acres. In addition to the area thus brought directly under the provisions of the act, a little over 2,500,000

acres which were held under the old system have been brought under the Torrens system by voluntary application. Thus in New South Wales at the end of 1925 the areas respectively held under the two systems were approximately: —Torrens, 45 million acres; old system, 4½ million acres. The rate at which old-system titles are being converted into Torrens titles is, however, very slow—during the decade 1916-25 only 36,316 acres per annum have been so treated—and, unless some steps are taken to make registration of title under the Real Property Act compulsory, many years may elapse before the whole of the private lands of the State will be held under a uniform system. In Queensland the rate of conversion has been more rapid, over 97 per cent of the area formerly held under the old system title having been brought under the Real Property Act.

The advantages of the Torrens system are best exemplified by a comparison with the old system. Old-system title depends upon a chain of documents and events stretching back ultimately to a grant from the crown. The investigation of such a title is laborious and expensive; every relevant document must be produced and scrutinized, every event strictly proved. The registration of deeds under the old system (which must not be confused with the registration of title under the Torrens system) involves long and hazardous searches in order to determine priorities. The index-books upon which the searchers must rely are sometimes misleading; the searchers themselves are not infallible. Every time the property is sold or mortgaged the investigation must be repeated, for it is unsafe to rely upon previous acceptances; there is no finality to the process; above all, there is no absolute certainty at any stage that the title accepted is indefeasible, that there are, as Torrens himself put it, 'no after-claps to dread.'

In the case of a Torrens title a single sheet of paper (called a 'certificate of title') takes the place of the deeds. When an application is made to have land brought under the provisions of the act, the applicant's title is investigated by a body of competent officials. Upon the application being granted, the instruments evidencing the common law title are cancelled. The certificate of title is bound up in the register-book and a duplicate is issued to the registered proprietor. It sets out in a few words that 'A. B. of, etc., is now the proprietor of an estate in fee simple (*or as the case may be*), subject nevertheless to the reservations and conditions, if any, contained in the Grant hereinafter referred to, and also to such encumbrances, liens, and interests as are notified hereon, in (*description of land and reference to original Crown Grant*).' Should A. B. subsequently sell the land to C. D., the only title it is necessary for him to show is the fact of his registered proprietorship—a fact which is conclusively evidenced by the certificate. A transfer on a simple printed form is filled in, signed, stamped, and lodged (with the duplicate certificate of title) for registration, which is effected by entering a short memorial in the register-book and endorsing the same upon the certificate of title; for example 'No. B 178011 Transfer dated 5 February 1925 from the said A. B. to C. D. of, etc., of the land within described,' with a note as to the time of production and entry. Other dealings with the land, e.g. mortgages and leases, are similarly registered. When the available space on the certificate is filled with notifications, a fresh certificate is issued and the old one cancelled. Where part only of the land comprised in a certificate is transferred, the certificate is delivered up to the registrar-general and partially cancelled; the transferee is given a new one in respect of the land transferred to him, and the transferor may, if he so desires, obtain a balance certificate in respect of the residue. At every stage a mere glance at the folium of the register-book constituted by the existing certificate of title will show conclusively who the registered proprietor is, and the nature of his estate or interest.

The act in effect provides a statutory system of conveyancing. No instrument, until registered in the prescribed manner, is effectual to pass any estate or interest in the land, and, except in the case of fraud, purchasers and others dealing with the registered proprietor are not affected by notice—even direct notice—of any trust or unregistered interest. This does not mean, however, that the act leaves trusts and unregistered interests entirely unprotected. Though notice of trusts is not entered in the register-book, an instrument declaring trusts may be deposited with the registrar-general, and in New South Wales the registrar-general will thereupon enter a caveat forbidding the registration of any instrument not in accordance with the trusts declared. A caveat against dealings may also be lodged by any person claiming any estate or interest in the land or under any unregistered instrument. The caveat has the effect of a statutory injunction, and so long as it remains in force—provisions of course exist as to its removal—the registrar-general is forbidden to register any dealings with the land in respect of which it is lodged. Thus a purchaser may lodge a caveat to protect his interest under a contract for sale. Unregistered mortgages or leases may be similarly protected.

The Torrens system not only facilitates and simplifies transfers of land, but it also renders titles more secure. The registered proprietor holds the land subject to the notifications on his certificate of title, but (with certain specified exceptions) absolutely free from all other encumbrances, liens, estates, or interests whatsoever. Moreover, in some States, as against the registered proprietor, title cannot be acquired by any length of possession by virtue of any statute of limitations. No registration system can entirely eliminate the possibility of fraud or error; cases therefore may and do arise in which owners suffer deprivation by the operation of the act. To meet such cases an assurance-fund is provided, out of which compensation is paid to persons damnified. The assurance-fund is sustained by small contributions (normally ½d. in the £) paid into the fund on certain individual transactions, e.g. primary and transmission applications. Claims against the fund, however, are of rare occurrence. In New South Wales, for example, the balance to the credit of the fund at 30 June 1926 was £411,696. The total amount paid into the fund from its inception was £430,352, as against which the total amount paid out was only £18,656. Of this, £12,414 was paid out in respect of one claim. During the last 20 years the fund has been drawn against 14 times, for amounts aggregating £2330. When it is considered that transfers to the value of about £40,000,000 and mortgages to the value of about £30,000,000 are registered every year under the act, the figures quoted bear eloquent testimony to the efficiency of the system.

Although the Torrens system originated in

Australia and has there achieved perhaps its greatest measure of success, its influence has spread to various parts of the British Empire, e.g. Canada, New Zealand, Jamaica, Trinidad-Tobago, and the Leeward Islands. In all these the Australian model has been closely followed; the term 'Torrens' is there as commonly applied to the prevailing system as in Australia itself, and reference is frequently made by the courts to Australian authorities. Even countries outside the British Empire e.g. Norway, Denmark, and a number of the commonwealths of the United States, have followed the Australian example. It is true that in the United States divergent views have been expressed as to the merits of the Torrens system, and in many instances a system of title insurance has been preferred. It is necessary, however, to bear in mind that the introduction of the Torrens system into the United States has a constitutional aspect which does not present itself elsewhere. Apparently there are difficulties in the way of making the certificate of an executive official conclusive evidence of title, for an enactment to that effect might be held to be an encroachment by the legislature upon the sphere of the judiciary. The Torrens system is not seen at its best where, as is commonly the case in the United States, the primary registration is based on a decree of court and the effect of subsequent registrations is open to doubt. Nevertheless a commission of experts, appointed in 1907 "to examine the system of registering titles to real property, known as the 'Torrens system,' and to report on the establishment of that or a similar system in the State of New York," reported in its favour as against "the old method of searching titles and issuing policies of insurance thereon."

In Victoria and Western Australia the Torrens statutes are called Transfer of Land Acts; in the remaining States they are called Real Property Acts. Apart from other slight differences of nomenclature and certain minor differences of substance, the statutes are practically identical.

See J. E. Hogg's *The Australian Torrens System* (London, 1905) and *Registration of Title to Land throughout the Empire* (Sydney, 1920). On individual systems, for New South Wales see Canaway's *Real Property Act* (Sydney, 1902); Victoria, Wiseman's *Transfer of Land Acts* 1915-1921 (Melbourne, 1925); Duffy and Eagleson's *Transfer of Land Act* (Melbourne, 1895) Guest's *Transfer of Land Act* (Melbourne, 1895); Queensland, Power, Groom, and Graham's *Real Property Act* (Brisbane, 1902). Historical students will find interesting material in Torrens' *Speeches explanatory of his Measure for the Reform of the Law of Real Property* (Adelaide, 1858).

P.R.W.

Torres, LUIS VAES DE. See AUSTRALIA, DISCOVERY OF.

Torres Straits. See AUSTRALIA, DISCOVERY OF.

Tortoises and Turtles, vernacular name of an order (Chelonia, sometimes called Testudinata) of reptiles, principally distinguished by the shell or box of bony plates (carapace above, plastron below) in which the body is enclosed. Except in *Dermoche'ys*, the dorsal ribs and vertebrae are united and expanded into bony plates forming a carapace. The skull presents the appearance of a compact bony box, and in some species the elements of the parietal segment are expanded into plates that form a false roof to the cranium. The quadrate is firmly united to the skull. There are no teeth, and the jaws are covered with a horny sheath. In the marine species the limbs are paddle-shaped. The copulatory organ is single, and all species are oviparous.

The name 'tortoise' is usually restricted to land or freshwater forms, and 'turtle' to marine forms, but no exact distinction can be maintained; indeed, the word 'tortoise-shell' is applied to the ornamental carapace of the marine species *Chelonia imbricata* (Hawk's-bill Turtle). Other well-known marine species are the Green or Edible Turtle (*Chelonia mydas*), the Loggerhead (*Thalassochelys caretta*), and the giant Luth or Leathery Turtle (*Dermochelys coriacea*), which is placed in a distinct family. All these have a wide distribution. *Chelonia depressa*, with a flattened carapace, and *Colpochelys kempi*, the Bastard Turtle, are also found in our waters.

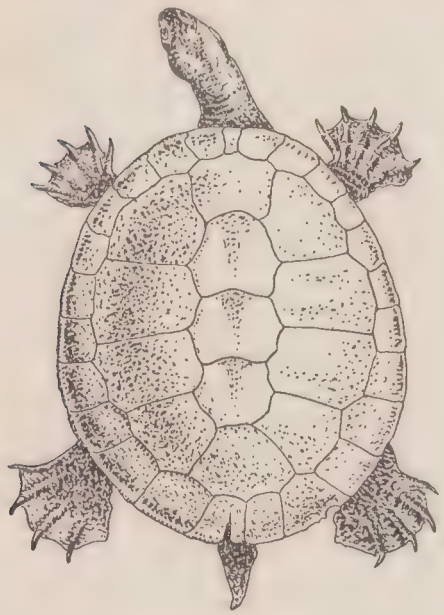
The edible turtle may be distinguished by the presence of only four large shield-like plates on each side of the central series of the carapace, whereas the loggerhead, which is carnivorous and not edible, has at least five. The head of the last-named is also considerably larger. The carapace of full-grown specimens of both species attains to over three feet in length; in the edible turtle there are always fontanelles near the marginal plates, but in adult loggerheads the carapace is completely ossified. The hawk's-bill, a smaller species, may be recognized by the overlapping (except in very old individuals) of its horny shields, which have a marbled pattern. The leathery turtle, which attains a length of nine feet, has a thick skin, with longitudinal ridges on the dorsal surface. The underlying carapace consists of numerous small pieces of bone, forming a mosaic-like structure. The vertebrae and ribs are not fused with the carapace. The paddle-like limbs are without claws. The powerful jaws are deeply notched anteriorly. This is the largest of present-day chelonians, and Agassiz stated that some specimens weigh 'over a ton.' The Cretaceous turtle, *Cratochelone*, from western Queensland was, however, far larger.

All chelonians lay numerous eggs. The female turtle visits at night a sandy beach beyond high-water mark, excavates a hole, in which she lays a large number of round, parchment-shelled eggs, and then covers them over. When turtles are caught on land and turned on their backs they are quite helpless. In shallow water an athletic person may get astride a green turtle and ride it in a way that almost rivals De Rougemont's story.

The collection of tortoise-shell from the hawk's-bill turtle for commercial purposes gives employment to a small number of licensed men (mostly aboriginals), who are also bêche-de-mer and pearl fishers. The industry is confined to tropical waters, and is chiefly centred on Thursday Island. In 1908 the output reached 5056 lb., with a value of £2776. In succeeding years there was a decrease, and for the years 1914-9 the average was 963lb., value £593. In 1924-5 the exported shell was valued at £2025. About 8lb. are obtained from a single turtle. In normal times there is a considerable demand for the article. An inferior shell is sometimes collected from the green turtle, and a company is now established at North-West Island, Barrier Reef, to utilize the meat from this species.

Of freshwater tortoises about ten species are found in Australia, all members of the family Chelydidae. The epidermal shields covering the shell are very thin. The genus *Chelodina* contains long-necked forms which, when disturbed, have the habit of bending their long neck sideways, and thus protecting it beneath the

bony armour of the carapace. The largest is the Lagoon Tortoise (*C. expansa*), not uncommon in Queensland, the upper shell of which may be about 12 inches and the long neck and head about 10. A smaller species (*C. longicollis*), sometimes called Snake Tortoise because of its long neck, is widely distributed from south-western Australia to Queensland. *C. oblonga* is found in the north and west, and in 1923 L. Glauert described *C. milly-millyensis* from Western Australia. The genus *Emydura* contains several short-necked forms, one large species of which (*E. macquari*) extends from south-eastern and north-western Australia to Papua, although specimens from the last-named locality are regarded by some authorities as a distinct species.



Emydura macquari.

This reptile is sometimes called the Murray River tortoise, and Edgar R. Waite reports that at one time it was utilized for 'turtle soup' and served to Europeans. *E. latisternum* is a Queensland species with prominent barbels on the shin, whereas *E. kreffii*, which has a yellow band from the eye to the ear (exposed tympanum), has no barbels. *Elseya dentata* is an allied species with special structural features. These reptiles are much at home in water, being web-footed, but on land their movements are clumsy. When disturbed, the head is hidden as much as possible under the carapace. They are hardy and long-lived, and in captivity they will thrive on raw meat, which is eaten under water. Some of the short-necked species are vicious and can inflict a nasty bite. The eggs are hard-shelled, white and elongated, and are laid in holes scooped in the ground. A curious feature is the transparent lower eyelid, through which the yellow-ringed eye of the tortoise may be seen looking out.

Freshwater Chelonia are numerous in Papua, and two unusually large river forms, *Carettochelys insculpta* and *Devisia mythodes*, have been described. See REPTILES. H.A.L.

Totalisator, THE, is a mechanical device for automatically registering and displaying the total amount invested on each starter in a race, and the aggregate investment on that race, with a view to dividing the total sum invested—in proportion to the amount staked by each—among those who have put their money on the winner (or, in a separate pool, on a 'placed' horse). Several other machines have been devised for this purpose, the best known being the Pari-Mutuel, which has been in use on most of the race-courses in Europe since 1866; but none have been satisfactory, for the reason that they require an army of clerks to sum up the value of the tickets sold at all the booths on each race, and even then it frequently happens that the dividend is not available until three-quarters of an hour after the race is over. Moreover, they do not inform the investor to what extent the horse of his choice has been backed. G. A. Julius (a New Zealand engineer long resident in New South Wales) invented a 'totalisator' which is entirely automatic, is practically instantaneous in its operation, and, moreover, informs the assemblage as to the amount of money invested on each horse, and the total amount invested on the race, at every instant during the betting. Every selling-window has a printing equipment, controlled by a keyboard. When an investor takes a ticket on any horse at any selling-window, the operator presses the appropriate button and sets the printing-machine in motion, thereby printing a ticket available for that race only and for the particular horse, and at the same time automatically recording the sale on the totalizing part of the machine. The record from the selling-machine is transmitted electrically, and the totalisator record is complete for each horse unit, and for the grand total, within a few seconds of the sale of the final ticket. The machine operates in such a way that the various selling-windows could be printing and issuing tickets of different values, whether on the same or on any horse in the race, at precisely the same instant, the totalisator meanwhile accurately recording the sum-total of the tickets sold, either in money values or by showing the equivalent number of tickets of the lowest denomination that have been sold. At different points on the race-course special indicators work synchronously with the main totalisator, and exhibit from instant to instant the sum and the allocation of the investments. Selling-booths may be set up anywhere on the course, and indicators can be placed adjacent to groups of such booths, so that investors there may ascertain what the investments are on any horse at that particular moment. The wheels of the totalisator cease to move within five seconds of the termination of the betting (at the Randwick race-course, Sydney, it is under the control of the chairman of the stipendary stewards, who locks the machine the instant the race starts), and the dividends (less the statutory deduction) can be declared within half a minute of the telephoned news of the result. Betting can therefore be permitted right up to the starting-time of the race, and dividends are available immediately the weight-flag is flown.

When horses are backed for 1st, 2nd, or 3rd place, the total amount of place-money received, less the statutory deduction, is divided up in some fixed ratio; such, for instance, as 60 per cent to holders of tickets on the first horse, 25 per cent on the second, and 15 per cent on the third. The number of 'placed' horses need not be three; at Randwick the totalisator pays first horse only when five or fewer horses start in a race; first and second when six and not more than eight horses start, paying in such

case at the rate of 75 per cent and 25 per cent respectively; first, second, and third when nine or more horses start, paying then at the rate of 60 per cent, 20 per cent, and 20 per cent respectively.

In Australia a percentage is retained to cover cost of administration, and a further percentage for revenue or charitable purposes. These percentages are fixed and controlled by the various State governments.

Except in the State of Victoria, the totalisator is in use on all the principal race-courses in New Zealand and Australia, as well as at Colombo, Madras, Bombay, Rangoon, and Singapore; now it is about to displace the Pari-Mutuel system at Longchamps (Paris). The largest installations are at Randwick (New South Wales), Auckland (New Zealand), and Bombay (India). On the machines of each of these three places provision is made for 120 selling-windows, at which tickets varying in value from 10s. to £10 can be obtained; provision for investors of large amounts is made in the commission-room. The equipment for Longchamps will make provision for 260 selling-windows, located in many different positions on the course and selling tickets ranging in price from 5 to 5000 francs each. Double machines will be installed to allow of the backing of a horse either for a 'win' or for a 'place,' the ticket-issuing or printing-machines being equipped with a double keyboard for this purpose. Double indicators will be installed at four positions on the course, so that the state of the betting for win or place will be made known simultaneously at all the groups of selling-booths. Hitherto all these totalisators have been made in Sydney, but now that the machine has been taken up in France, it is probable that some part at least of the equipment will be manufactured there.

Tourmaline. See GEMSTONES and MINERALOGY.

Town-planning. The early development of most Australian towns was conditioned almost entirely by the immediate needs of their inhabitants—supplies of food and drink (including water), trade, administration, and (in the case of seaports) defence. As in the early North American settlements, their nucleus was a collection of buildings containing food, drink, produce of the neighbourhood, and goods brought from other settlements or from oversea—the name 'store' for a shop still commemorates the primary use of these buildings—and situated along or near the main roads or streams used for transport. The administrative buildings were as a rule placed centrally, residences sprang up on the outskirts of the settlement within easy reach, and minor roads connected the infant town with outlying farms and such military outposts as might be necessary. The growth of population entailed a more accurate allocation of land, and out of the pioneer military surveys grew a civil land-survey system which provided a basis for later developments. From 1830 onwards plans prepared in England by Edward Gibbon Wakefield's associates considerably influenced town-building in Australia, but by that time Sydney, Hobart, and Brisbane had assumed the shape which still persists at their centres. Even in the 1830s, however, too little account was taken of natural features, and areas were subdivided without reference to their contour, geology, or prevailing climate; this defect was unfortunately emphasized by subsequent local-government legislation, and is repeated in recent subdivisions of suburban lands.

The first conscious legislative efforts to provide for an orderly growth of towns were the local-government acts of 1840-60 (see LOCAL GOVERNMENT). At first they included a few provisions for general betterment; later acts contain specific clauses or sections concerned with town-planning, and these are so curiously wide in their ambit as to leave almost no necessity for more specific legislative enactments. Unlike European and American cities, Australian cities have acquired legislative power in this direction in advance of the need being generally recognized; by co-operation between municipal councils more and better use could be made of existing legislation.

For the planning of the Commonwealth capital city, Canberra—the first and, so far, the only Australian city which has been laid out wholly on a pre-determined plan—see CANBERRA.

New South Wales.—Within six months of landing at Sydney Cove, Phillip devised a creditable plan for his new town of Sydney. His centre was the military parade-ground on the side of the hill between Bridge- and Argyle-street; from this he ran several streets 200 feet wide, most of them in a south-westerly direction to take advantage of the prevailing north-easterly wind —he was very emphatic about the 'free circulation of air.' When, however, he discovered that the soil near Sydney was poor, while that at the head of the Parramatta River (Rose Hill, q.v.) was much more fertile, he seems to have lost interest in Sydney itself, which became a mere depot for landing stores, etc.; and, when he returned to England, his plans (which had entirely disregarded the natural contours) were thrown aside, officers of the New South Wales Corps planted their residences where they thought fit, and the settlement became shapeless. Grimes's plan of Sydney in 1800 (reproduced in the *Historical Records of N.S.W.* vol. v.) indicates a possible street parallel with the western bank of the Tank stream, and elsewhere merely allotments sited at haphazard. Streets somehow came into existence, for in 1807 Meehan mapped seven running north and south and half a dozen of less importance running east and west; but in 1808 Foveaux describes the streets as almost impassable, and Bligh in October 1807 complained that ground had been irregularly leased to such an extent as to make effective town-planning impossible. Foveaux claims to have encouraged 'the extension, ornament, and improvement of the towns, especially of Sydney, which latter consideration seems never to have operated on the minds of former governors:' Macquarie frankly abandoned the attempt to re-plan (except by clearing Macquarie-place near government house and shifting the markets from the neighbourhood of Sydney Cove to 'a more commodious and central situation'), and confined his reforms to making the best job he could of the narrow thoroughfares and crooked by-ways that his predecessors had left him. Sydney grew, as most of its suburbs have grown since, by the uncoordinated and often conflicting efforts of private landowners and speculators.

New South Wales still lacks mandatory legislation with regard to town-planning. Under several local-government acts (principally that of 1906) preceding the consolidated act of 1919, local authorities were invested with limited powers of a town-planning character—power to plan and construct roads and streets, to devise town-improvement schemes, to regulate the erection of buildings, to provide and maintain parks and public open spaces, and to provide housing for the families of working men. In the act

of 1919 (which applies to all local authorities within the State except the city of Sydney), part xii deals specifically with town-planning of an optional character, and under it local authorities are empowered to plan new roads and subdivisions; to re-arrange, alter, widen, or extend existing roads and subdivisions; to construct new buildings; to demolish and reconstruct existing buildings; to sell, lease, alter, remodel, improve, or otherwise embellish the area; to require roads to be planned with due regard to traffic; to fix a standard number of houses and of lots per acre, and a minimum size of lot on which a house shall be built; to require plans of subdivisions to be submitted for approval beforehand; and to require the paving, kerbing, and draining of all streets in private subdivisions. Further, private subdivisions may be controlled as regards the situation and planning of roads in relation to those of neighbouring localities, the methods of drainage, conveyance in fee simple of open spaces, character of road construction, treatment of intersections, classification of districts or zoning, tree-planting, shape of building-lots, access, percentage of recreation-space, position of water and gas mains, and transverse conduits; and the council may insist on such provision for health, convenience, and amenities as may be appropriate to the use made of the areas. Part xiii of the act makes special provision for the creation and preservation of parks, public reserves, and other recreational spaces, public baths, libraries, gymnasia, etc. Other parts give the local authorities control over the survey, construction, and lay-out of public roads, and over the digging-up of such roads by other public authorities; and allow them to prescribe the traffic-use of highways, segregate traffic on prescribed routes, prohibit traffic likely to cause more than ordinary wear and tear, and widen roads by resumption of bordering land or by colonnading—i.e. supporting on a colonnade the first floor of a building and making a pathway under it at the ground-level. Unfortunately the responsibility for work requiring a high standard of technical training and experience is devolved upon a purely non-technical body (the local council) and the advantages and objectives of the act are thus almost entirely destroyed. In South Australia the same powers can be exercised only with the approval of an official technical adviser.

The city of Sydney is excluded from the act, its administration being regulated by the Sydney corporation act of 1902, with subsequent amendments. This act empowers the city council to purchase or resume lands required for new public ways, housing, or for carrying out improvements in or remodelling any portion of the city; to make any necessary alterations on the property thus acquired; and to control advertising hoardings.

In 1919 a town-planning bill was introduced into the legislative assembly, but was not proceeded with. Its main provisions were (*a*) the grant to local authorities of power to plan development or reconstruction within their areas with a view to health, amenities, convenience, and commercial advancement, and (*b*) the constitution of a town-planning board of three permanent members, appointed by the governor.

Apart from legislation, in 1914 a Town Planning Association of New South Wales was formed to promote town and city development on town-planning principles; and in 1922 was inaugurated a Regional Plan Convention to prepare a regional survey and plan of development for Sydney and its environs.

Victoria.—Melbourne was planned by Robert Russell (a pupil of John Nash, the designer of Regent-street in London) in 24 ten-acre blocks separated by two streets running roughly parallel to the course of the Yarra (ENE.), which are known as Collins- and Bourke-street, and seven shorter streets at right angles to the two. The natural contours were ignored, and the general direction so chosen that the prevailing winds blow along every parallel street at once. Russell's plans were altered by Governor Bourke and his surveyor Robert Hoddle (q.v.) to include the 'lanes'—afterwards dignified with the names 'Little Collins-street,' etc.—which are so awkward for the traffic of modern Melbourne, and on 8 March 1837 the town-plan was formally initialled by the governor. Its rectangularity was not a new device; Bathurst and Goulburn in New South Wales had already been laid out on those lines, and Russell himself ascribed its origin to 'a plan in the Sydney office generally approved as suitable for laying out a new township.' Other large Victorian towns embody the same idea, superimposed on their first casual development along bush-tracks and gold-miners' footpaths. Ballarat, in which from 1853 onwards surveys preceded settlement, is an exceptionally favourable specimen of 19th-century town-planning with wide, tree-planted streets.

Recent Victorian town-planning activities may be said to date from the consolidated local-government act of 1915, by which local authorities are empowered to control subdivision-plans and require that adequate provision be made for roadways, etc. (these provisions, though not directly of a town-planning character, in effect function as such). Under the housing and reclamation act of 1920 these powers were extended to allow the provision of dwellings for persons of small means, and the reclamation and improvement of unsanitary, low-lying, or overcrowded areas. With regard to areas required for reclamation purposes, councils were empowered to levy a betterment charge of half the increase in value of the surrounding lands. Under the Melbourne metropolitan town-planning commission act of 1922 a commission of nine members—one nominated by the Melbourne city council, four by suburban municipal councils, and four representing business and technical professions—was directed to report upon the conditions and tendencies of urban development, setting out general plans, recommendations for the better guidance and control of development, and estimates of the cost involved. Its first report, issued in 1925, includes recommendations with respect to street and road requirements, means of transportation, traffic regulations, wharfage and water-front improvements, amenities (including the conservation of natural beauties and the control of unsightly objects and structures), the classification of districts for residential, factory, business, or noxious-trade purposes, parks and recreational areas generally, land-subdivision, building regulations, housing, food supplies and distribution; suggestions for the co-operation of public and private bodies; and proposed amendments to existing legislation—a fairly comprehensive syllabus.

The Town Planning Association of Victoria is a voluntary organization which extends its educational activities throughout the State.

South Australia.—The planning of Adelaide was a matter of long consideration in England before the first settlers reached Australia. Colonel Light (q.v.) took with him instructions closely defining not only the qualities de-

sirable in the site he was to choose, but the principles 'with reference to convenience, beauty and salubrity' which were to guide him in laying out streets, reserves, public squares, etc. On 10 March 1837 he completed the subdivision of 700 acres south of the Torrens and 342 acres north of it, separated by a belt of park-land; 36 of the acre-lots were reserved to make public squares within the town, 6 more to provide a square for North Adelaide, and the plan was completed by Governor Gawler's orders with the reservation of strips of park-land east, south, and west of the main town.

South Australia is the first State with mandatory legislation for the successful carrying out of modern ideas concerning town-planning. Apart from local-government legislation the earliest attempt in this direction was the passing of a 'control of subdivisions of land' act in 1917; this act is administered by the surveyor-general. In 1920 was passed a town-planning and development act which applies to the whole State except the city of Adelaide. It created a town-planning department of the public service, with a permanent head (known as the government town-planner) who, besides acting as adviser to the minister, prepares plans for any new town, town extension, garden city or suburb, industrial or factory area, and supervises all re-plannings or improvements and all matters relating to town-planning. He may issue memoranda and reports and collect fees for work performed by him or the department. The act also provides for the constitution of a central advisory board consisting of the government town-planner, the surveyor-general, a civil engineer, an architect, a nominee of the municipal association and one of the local government association of South Australia. Any municipal council may elect, or be directed to appoint, a town-planning committee and a local administrator to act in conjunction with the department.

Western Australia.—The planning of Perth was the work of Captain James Stirling, who decided that his Swan River settlement needed two towns, one for a seaport, the other for the seat of government. Having selected Fremantle for the port, he picked for the capital three square miles of comparatively level country nine miles up-river, and laid it out in 10-acre blocks (some were smaller) to be held on a 21-years' lease. Stirling did not contemplate a large town, as he had it in mind to found three others within a radius of 25 miles. Under an act of 1838 the town was placed under a board of trustees—a form of local government that lasted till 1871, when a municipality was created; but little progress was made until the gold discoveries of the early 1890s greatly increased the colony's population and stimulated growth in its capital city. This growth, however, was along indefinite and uncoordinated lines, and the narrowness of the streets still hampers expansion.

The State has no specific legislation for town-planning, but local-government acts, as in other States, provide a chance of development on modern lines. A municipal corporations act of 1906 applies to most towns, Perth being governed under its own improvement act of 1913. An endowment lands act of 1920 places under the Perth city council Ocean Beach and other adjacent areas, which the council may lay out, classifying areas for residence, factory, business, noxious trades, parks, etc., controlling the design, location, and occupational purpose of all buildings erected on them (as well as streets and advertisement hoardings), and providing generally for the 'health, convenience, and amenity of the population in the area.' In 1914 a town-planning bill for the whole State was submitted to the government; it provided for a town-planning commissioner and an advisory board consisting of the commissioner, a financial member, an architect, an engineer, and a surveyor, and allowed any municipal council to elect an advisory committee and a local administrator to act in conjunction with the government department. This bill is still (1926) under consideration.

Queensland.—The establishment of the settlement at Brisbane is described under that heading. At first buildings were sited purely for the convenience of the officials, the settlement being intended for convicts and their guards only; but when in the early 1840s it became a free town, John Dunmore Lang and other zealous citizens urged on the authorities the need of a definite town-plan, and excellent results might have followed had not Governor Gipps (if the legend is true) directed his surveyors that, if the streets of London were wide enough for the metropolis of the world, the streets of Brisbane need be no wider. Most of Queensland's country towns grew up haphazard, but Rockhampton was in 1858 definitely planned with wide streets and rectangular blocks by Arthur Francis, a Melbourne surveyor.

The State has as yet no specific town-planning legislation, nor do the various local-government acts contemplate developments of that nature. A 'Greater Brisbane' act of 1924, however, includes specific provisions for such developments in the State capital.

Tasmania.—The first settlement at Hobart in 1804 was of the usual unsystematic kind, but Macquarie in 1811 had proper surveys made and decided the directions and names of the main streets. The town was definitely planned by the then surveyor-general, George Frankland, under a police act of 1838, and its growth was further systematized by legislation of 1852, 1857, and 1893. Such provisions for town-planning as exist in the State are derived from powers given to the municipalities in the local government act of 1906.

N.W.

Towns, Robert (1791-1873), born at Long Horsley in Northumberland on 10 November 1791, and educated at the village school, was in early youth apprenticed on a collier trading between Shields and London. In 1810 he became mate and in 1811 master of the vessel, and in 1813 was given command of a brig engaged in the Mediterranean and Levant trade. In 1827 he visited Australia in his own ship *The Brothers*; in 1828 he brought out the ship *Bonavista* (which was wrecked on Frederick Reef), and sent the Admiralty some useful reports on the reefs towards Torres Straits. Afterwards he traded regularly between England and Australia in *The Brothers,* which was the first passenger ship to take home a cargo consisting entirely of wool. In 1836 he received a bonus (£18 for each adult and £5 for each child) for bringing out a number of families as colonists. In 1842 he settled in Sydney, founding the firm of Towns and Company, and became a pioneer in the South Sea trade; he also engaged largely in squatting in Queensland, and was the first to introduce cotton cultivation (q.v.) on an extensive scale, forming a plantation of 2000 acres, on which he employed 260 South Sea

islanders for several years. In 1851 he took an active part in reorganizing the Bank of New South Wales, increasing its capital and developing its operations to meet the growing demands of the colony; in 1855 Alexander Stuart (q.v.) resigned from the bank to join the firm. In 1856 Towns was nominated to the New South Wales legislative council; he retired in 1861 but was renominated in 1863, and remained a member till his death. Towns contributed largely to the building fund of St. Andrew's cathedral, to which he presented the pulpit. He died at Cranbrook—now the home of a public school—on 11 April 1873. Townsville in Queensland is named after him.

Trade and Commerce. The development of commerce in Australia has been greatly aided by three factors. Under the protection of the imperial navy, Australia has never been invaded; her huge area has given opportunity for an amount of primary production very large in comparison with her small population; and her great mineral wealth, especially in coal, has been of material advantage both to her export trade and to secondary production.

1788-1851.—Before the gold discovery in 1851 the trade of Australia was insignificant, since the white population was small, and in her early days development was retarded (for a time) by the opposition of the East India Company, which had a monopoly of British trade in all waters between the Cape of Good Hope and Cape Horn. The length of the voyage and the small size of the sailing-craft employed also delayed trade development. Through the East India Company's influence the building of vessels in Australia for oversea trade was forbidden (see SHIPBUILDING), and as late as 1805 it greatly hampered the sale of Australian goods in England. British whalers gradually established an independent position in the South Seas, and about 1806 trade with Australia was released from some of its burdens; the East India Company lost its monopoly in 1813, and an imperial act of 1819 completed Australia's commercial liberation by removing all restrictions on the tonnage of vessels trading thither.

The earliest imports were mainly government stores shipped at long intervals in vessels of from 250 to 350 tons burthen. The first private cargo reached Port Jackson in the *Lady Juliana* on 3 June 1790; it and its successors were as a rule bought up by officers of the New South Wales Corps (q.v.), who thus practically established a monopoly. To break this, Governor King in 1801 supervised sales of private imports, allowing a fixed advance in price of 50 per cent upon cost; by 1802 these precautions were found to be unnecessary, and from 1814 the government obtained all its requirements from Sydney merchants.

A report made by Governor Bligh in 1807 shows that trade was springing up with the Pacific islands, especially Fiji, and that sealskins, sandalwood, and a few ornamental timbers were being exported to England; imports arrived at long intervals from England, and occasionally cargo was brought by a vessel from India or the United States. By 1820 this trade had greatly expanded—Sydney had 12 firms of importers, and in the first four months of that year six vessels of from 370 to 500 tons left England for New South Wales. Australian exports in 1820 included flour to The Cape Colony, horses to Batavia, and coal to Batavia and India. In 1802 the tariff on imported goods of non-British origin was only 5 per cent *ad valorem*; but by 1823 the tobacco and spirits duties had been much increased, and specific duties were levied on some other articles; British goods were still exempt. In that year Sydney imported 14,654 tons in 55 vessels—the value of the cargoes is not officially stated; the exports, in 16 vessels, totalled 5500 tons, valued at £100,000—wool, whale-oil, timber, and sealskins to England, and wheat to Cape Town and to Rio de Janeiro. The subsequent expansion of commerce corresponded on the whole to the slow growth of the population, being only interrupted by the grave commercial crisis of 1842-3, when sheep were sold at 6d. a head, cattle at 7s. 6d., and valuable horses at £3. In 1851 Australia's population of about 400,000 exported goods to the value of £2,708,000 (wool representing about 55 per cent of the whole), and imported £2,962,000 worth.

1851-8.—During this period the first railways were constructed, direct communication by steamer with Europe was initiated, and the coalmines of New South Wales were systematically developed. But all these influences together affected Australian trade less than the discovery of gold and the huge influx of immigrants that followed. The excess of arrivals over departures for 1851-8 totalled 450,000, and if each brought in £25 (a moderate estimate) the capital available in Australia had increased by 11¼ millions. As the excitement abated, many miners turned to farming, or to the trades in which they had previously engaged—and trade at this time offered surer, if less alluring, profits than mining. The various goldfields needed food-supplies close at hand, and this led to an increase of closer settlement, which—especially in New South Wales, where the diggings lay far apart and were usually inland—to some extent displaced squatters and forced them to seek pastures farther afield. Thus both pastoral and agricultural industries were encouraged. On the other hand, town life became more comfortable and amusing, and it was in this period that the tendency to concentrate in the larger cities, now so marked a feature of Australian life, was first noticeable. Melbourne particularly, owing to its proximity to the richest of the goldfields, and the consequent expansion of trade both in local manufactures and in imported goods, soon passed Sydney in population and wealth, and in 1858 the trade of Victoria was worth nearly double that of New South Wales. A further effect of the gold-rush was a sharp rise both in wages and in the standard of living among the wage-earning classes. Previously they had been satisfied with conditions slightly better than those existing in England; but the scarcity of labour gave them a lever with which to raise wages, and the sudden prosperity of lucky miners who had been their fellows roused them to strive for the betterment of their own conditions. In 1858 Australian exports were valued at £14,625,000, the imports at £17,668,000, so that the value of oversea trade per inhabitant was nearly £32. Wool-exports during 1851-8 doubled in value.

1859-72 was a transition period. The gold-fever was subsiding, and wages fell slightly, as well as rents and food-prices. Trade steadied; in 1862 the exports amounted to £18,065,000, and the value of oversea trade per head was £32 11s. 6d. Serious development of the country became possible, and in several colonies attempts were made to establish small farmers on land previously devoted to sheep; assisted immigra-

tion, the extension of railways, and the adoption of protection as Victoria's fiscal policy, all tended to make the country more self-supporting. It was, however, a period of money stringency, and New South Wales was at one time paying 7½ per cent on debentures. In 1872 the value of Australian exports was £22,578,000—a rise of 54 per cent in 14 years, as against one of 440 per cent in the eight years of the gold-fever.

1872-93.—During most of this period the production of gold declined greatly—from a value of 7½ millions sterling in 1872 to one of 4½ in 1886. Immigration also slackened, the extension of cultivation was slow, and there was no great demand for land (Victoria and South Australia, however, increased their cultivated area from 2½ to 5½ million acres). Prices of pastoral products fell nearly 50 per cent. On the other hand, New South Wales profited largely by a much increased output of silver (from Broken Hill), copper (from Cobar), and coal. Victoria also extended her manufacturing plants, until in 1889 her factories employed some 57,400 hands. All these influences tended to steady trade figures, and, though with remarkable fluctuations, the value per inhabitant of oversea trade fell from £24 in 1872 to a little over £19 in 1892. The end of this period was made notable by a disastrous crisis. In the seventies and eighties private capital from abroad had been entering Australia and encouraging unlimited speculation. The colonial governments, instead of restricting expenditure, borrowed lavishly (as lavishness went in those days) and helped to create an artificial prosperity. A slight reaction began in 1886 with an all-round fall in export prices wherever world-prices ruled the market; a reduction of wages followed, and produced strikes in many industries, more particularly among the coal-miners of New South Wales (see STRIKES). Thereupon the influx of private capital lessened markedly, about 1892 government expenditure was also restricted, and unemployment increased. With this reaction in operation the banks thought it wise to call in their advances —which had in far too many cases, and to too great an extent, been made against land. The crash that soon followed is more fully described under BANKING; its effect on trade may be gauged from the fact that the value per inhabitant of oversea trade fell in 1894 below £16—the lowest figure since 1851. In 1893 the value of oversea trade (both ways) was 57 millions, an increase of nearly 38 per cent over that of 1872; but the increase in population had been over 90 per cent.

1893-1914.—The crisis of 1892-3 was by no means an unmixed evil. It restricted—temporarily, at least—the borrowings of the colonial governments; it reduced imports, so that the percentage of exports on imports, which in 1890 had been 83.4, rose by 1895 to 145; it placed reasonable limits on trade credit, which had been given far too readily; it checked speculation and ensured a revaluation of land more nearly approximating its actual earning capacity. Wages fell, but so did rents and prices. Individuals were ruined, but the community found itself in a much healthier condition. Further, the restrictions on government expenditure sent many men back from the cities to the farms and stations. Recovery from the disaster was quickened by an all-round revival in the mining industry, which culminated in the Western Australian gold discoveries of 1894-5. But for the drought years of 1896-1902, which tried the eastern colonies sorely, recovery would have been even more rapid. In spite of the drought, however, the value of exports increased with comparatively slight fluctuations from 32 millions in 1894 to nearly 79 millions in 1913, and throughout the period was always greater (in 1904 and 1906 more than 50 per cent greater) than that of imports; the total trade overseas increased during the same period from 54 millions to 158 millions, and the value per inhabitant from below £16 to £33.

Upon federation in 1901 the Commonwealth government was given many important powers relating to the trade of the Commonwealth. Collection of customs and excise was handed over by the States, and a uniform tariff introduced. The constitution act gave the Commonwealth power, *inter alia*, to make laws in respect of trade and commerce with other countries and among the States; to determine bounties on production or export of goods; and to control foreign trading or financial corporations formed within the Commonwealth. Largely through the need of settling returned soldiers on the land, the Commonwealth has utilized its powers extensively in granting advances and bounties in respect of dried and canned fruits and wine grown for export, and has also set up control boards to deal with export of dairy produce, meat, etc. Steps have been taken to promote inter-Empire trade by arrangement of preferential tariffs with Great Britain, South Africa, and New Zealand, and of a trade treaty with Canada.

H.Y.B.

1914-18.—The war materially affected Australian oversea trade. Disturbance arose mainly through dislocation of shipping and increased prices. Direction of trade was greatly altered. In spite of the rise in prices brought about by war conditions, recorded values of trade during the four war years showed no appreciable advance. The average annual value of imports for the period was only £71,223,000 as against £70,129,000 for the four years immediately preceding the war; in the case of exports, the average annual value decreased from £78,688,000 to £77,910,000. Exports, on a quantitative basis, were actually less during the war period than for the four years preceding it. The United Kingdom and allied nations made a heavy call upon Australian food-stuffs, wool, metals, and horses. The ability to supply depended largely, as usual, upon seasonal influences. Unfortunately the seasons were not uniformly favourable, that during the first year of war being particularly dry. Though productive effort was increased in the national emergency, reduction of labour forces through enlistment tended to restrict output. Freight space became difficult to obtain; nevertheless considerable shipments were despatched oversea under convoy. Special measures were adopted for the marketing of wool, wheat, and metals, and these more important commodities were given preference in allotment of the limited amount of freight available. Wool was sold to Great Britain under an imperial government purchase scheme. Later, an organization known as the British-Australian Wool Realization Association ('Bawra') was given control over the disposal of war-time carry-over wool. The wheat harvests were handled and marketed by compulsory pools, and metals were disposed of under special war-time contracts.

Imports were reduced as oversea manufacturers became occupied in the production of munitions of war. There was compulsory curtailment of

inwards trade because of the shipping shortage. Moreover, the Commonwealth's consumptive demand was restricted, more or less voluntarily, through a large part of the spending power of the people having been diverted to war loans. Over £200,000,000 was raised internally for war purposes.

Initial dislocation of trade was pronounced. For the first year of the war (1914-15) the total value of oversea trade was only £125,025,000 —a smaller figure than had been recorded for any year since 1909. Exports at £60,593,000 were £18,000,000 below the previous year's figures; imports at £64,432,000 showed a fall of over £15,000,000. Part of the contraction in exports was due to drought. After the first war year there was some adjustment of trade to the new conditions, and the years 1915-16 and 1916-17 witnessed expansion in recorded values of both imports and exports, the total of trade for the latter year reaching £174,184,000. The increase, however, was attributable largely to deferred shipments and increased prices. The last year of war proved the most difficult. By 1917-18 shortage of shipping had been rendered acute by the depredations of enemy submarines. In order to conserve space for more essential requirements, the Commonwealth government in that year prohibited or restricted imports which were considered to be of the nature of luxuries. The value of imports for the year, in spite of the constantly rising level of prices, fell by nearly £14,000,000 to £62,335,000. Partly because of the somewhat unfavourable season, exports decreased by about £16,500,000 to £81,429,000, and the total oversea trade for the last war year at £143,764,000 was only £18,739,000 in excess of that for the first year, notwithstanding the enormous increase in prices.

1918-19 to 1924-5.—The years immediately following the close of hostilities witnessed great expansion in oversea trade. Australia did not escape the post-war boom and subsequent depression which affected trade in most other countries. Shipping facilities improved, and values of imports and exports showed marked increases. The total trade for 1918-19 was valued at £216,299,000—a rise of 50 per cent on that of the previous year. Imports jumped from £62,335,000 to £102,335,000, and exports from £81,429,000 to £113,964,000. The next year (1919-20) saw a further increase in the total trade to £248,798,000. Imports declined slightly, but exports increased to a very marked extent, and reached the high figure of £149,824,000, or £28 4s. 11d. per head—a record up till that time.

The post-war boom attained its height in 1920-1. Imports reached the exceptionally high level of £163,802,000—an amount greatly in excess of that of any previous year. The increase was brought about principally by the fulfilment of orders which oversea manufacturers had been unable to execute earlier. Stocks in Australia had become depleted during the war. In their anxiety to replenish stocks, and to take advantage of the free spending of returned soldiers' gratuity and repatriation moneys, Australian importers placed heavy orders abroad, in the belief that these could not be satisfied immediately, but hoping that a portion would be supplied within a reasonable time. As matters turned out, trade depression in the United Kingdom, and the cancellation of foreign orders, enabled British manufacturers to devote their attention to the requirements of Australian importers. The result was that shipments which had been expected to spread over a long period were received in quick succession.

Owing to the sudden and extraordinarily large demand for money in London, the banks had difficulty in providing exchange facilities, and accordingly restricted credit for import business. This caused a general outcry on the part of importers, but the policy was justified in the interests of the community. The import boom was essentially unhealthy.

For the first time since the beginning of the century, 1920-1 saw an unfavourable balance of trade, the percentage of exports on imports falling to 80.7. The salutary effect of the enforced check on imports was seen the next year in a reduction of 37 per cent in the value of inwards trade, accompanied by a contraction of only 3.2 per cent in exports, and the percentage of exports on imports rose to 124, on a total oversea trade of £230,913,000. Thenceforth trade was conducted on a more stable basis. The total for 1924-5 established a new record at £319,173,000, or £54 6s. 10d. per head of population. Exports for 1924-5 surpassed anything previously recorded, and amounted in value to £162,030,000. The year was notable for the abnormal height reached by wool values, which early in the year went to £39 per bale. Prices collapsed before the season was over, and confidence on the part of buyers was restored only after suspension of sales for nearly four months. The high average price of wool, together with a big wheat harvest which realized good prices, made the export year one of the most noteworthy in the history of the country. Exports showed a surplus of 3 per cent over imports, despite the fact that the value of the latter was swelled by importation of over £10,000,000 in gold. Exports of wool and wheat alone accounted for 64 per cent of the total value of exports, the value of these two items exceeding 103 millions sterling.

From the banking point of view the situation in 1924-5 was almost the reverse of that in the post-war boom year of 1920-1. Instead of a shortage of London funds, the banks found themselves with an accumulation of London balances which it was practically impossible to transfer to Australia, owing to the continued existence of the war-time embargo on movement of gold. Government borrowing abroad accentuated the position. Australian money went to a heavy premium. Telegraphic transfers on London were quoted at 70s. per cent discount buying. The banks complained that their supply of cash reserves in Australia was insufficient to enable them to finance the export trade. What threatened to become a most serious situation was relieved by the Commonwealth Bank act of 1924, which placed that bank under a board of directors—it having previously been controlled by a governor—and gave the board full authority over the note issue. By other provisions of the act the Commonwealth Bank was brought into closer touch with the private trading banks. An arrangement was entered into whereby wheat and wool exchange transactions were pooled among the banks. The Commonwealth Bank took its share of the business, and, in addition, guaranteed to make available the necessary currency to maintain the private banks' cash reserves, such additional currency to be returned at the close of the export season. As a matter of fact there was no expansion of the note issue. The knowledge that additional currency was available in case of need was sufficient. Under the scheme each bank proceeded to dis-

count exporters' bills with freedom, and the financing of the largest volume of export business on record was carried through without a hitch. The exchange pooling scheme worked so satisfactorily that it was continued during the subsequent export season, though the exchange position by then had returned to normal—owing principally to the restoration of the gold standard. The banks, just prior to the resumption of the gold standard, reduced their surplus London balances by importation of over £10,000,000 in gold, the rise in the dollar value of sterling having provided the opportunity for the transfer.

Direction of trade.—The direction of Australian oversea trade was modified considerably by the war. During the period of actual hostilities, of the total imports into Australia the percentage from the United Kingdom declined from 58 per cent to 37. Imports from enemy countries, of course, dropped to zero (the proportion received from Germany for the decade prior to the war had been slightly over 6 per cent). Meanwhile the proportion of imports from non-enemy foreign countries, and particularly the United States of America, increased appreciably. In 1918-19 the United States supplied over 27 per cent of imports into the Commonwealth as against only 12 per cent in 1913. From 1900 until the outbreak of war the proportion of imports shipped to Australia from British countries had been well sustained at about 72 per cent of the whole. By 1918-19 the percentage had fallen to about 60. The decrease was due wholly to contraction in shipments from the United Kingdom, as imports from other British possessions rose from 12 per cent to 22.

With the return of peace and the re-establishment of more normal conditions of trade, the proportion of total imports furnished by the United Kingdom recovered materially. British manufacturers became able once again to accept orders. Thus the percentage of imports from the United Kingdom rose from 39 per cent of the whole in 1919-20 to 52 per cent in 1922-3. That from all British countries advanced from 54 per cent to 64, despite some contraction in the proportion supplied by British possessions. This recovery of trade by British interests was at the expense mostly of those foreign countries which had increased their trade with Australia during the war. During the four years succeeding the close of the war the percentage of imports from the United States declined from 24 to about 19. Trade with ex-enemy countries was slow in being re-established. Apart from national antipathy, the imposition of special 'dumping' duties under the Customs Tariff (Industries Preservation) act of 1921 on goods from countries with depreciated exchanges operated against imports from many European sources. The proportion of imports from Germany, estimated at 0.01 per cent in 1919-20, had reached only 1.43 per cent in 1924-5.

Broadly, the United Kingdom has failed to maintain the position formerly held in the import trade of Australia. There was a marked slump in imports from that source in 1923-4, the proportion, at 45 per cent, showing a drop of 7 per cent as compared with the previous year. The principal off-setting increase was in imports from the United States, of which the proportion moved up to nearly 25 per cent. Loss of trade with Australia by Great Britain has been a matter of much concern, and since 1908 a permanent commissioner, appointed by the British board of trade, has been resident in Australia for the purpose of advising manufacturers and merchants in the United Kingdom with regard to Australian trade affairs. With the object of assisting British trade, a special preferential tariff has been applied to British goods since 1907. It has to be noted that increased imports from the United States have been largely in commodities non-competitive with British manufactures. For instance, increased imports of petroleum spirit, kerosene, and timber from the United States have not necessarily had any prejudicial effect upon the trade of the United Kingdom.

For some years prior to the war a constantly decreasing proportion of Australian exports was shipped to the United Kingdom. During the war Britain was afforded the first call on Australian primary products, with the result that the proportion of exports consigned thither increased appreciably, while a larger percentage than previously was shipped to other Empire countries, notably Egypt and India. For the quinquennial period preceding the war the proportion of total exports taken by British countries was 61 per cent, of which 45 per cent went to the United Kingdom; for the five-year period ended 1918-19 the proportions rose respectively to 74 per cent and 53 per cent. After the war there was an increasing tendency towards direct shipments of the more important primary products, such as wool, wheat, flour, skins, and butter to the consuming countries—France, Germany, Belgium, and Japan.

Price changes.—Though recorded values of oversea trade were inflated enormously by the rise in prices during the war, official estimates show that, on a basis of uniform prices, exports during 1914-19 were actually less than for the years immediately preceding the war (see PRODUCTION FROM INDUSTRIES). There was some improvement in the three years succeeding the war, and exports for 1921-2, on a quantitative basis, were reckoned to be about 22 per cent above the 1913 level. The next two years, however, saw a decline in relative quantitative results, and, by elimination of price changes, exports for 1922-3 were shown to be 96 per cent and for 1923-4 only 88 per cent of the 1913 volume. This decline in quantities exported does not necessarily reflect adversely upon the prosperity of the country. Since, and to a large extent as a result of, the war, Australia has developed its secondary industries, and is manufacturing an increasingly larger proportion of its own raw material (see MANUFACTURES). As the nation becomes more self-contained its volume of exports may be expected to decrease. Exports are required only to pay for imports and to cover interest on external borrowings and other commitments abroad.

D.H.S.

Trade-unionism. It has generally been assumed that trade-unionism in Australia had its origin in the industrial dislocation that followed the gold discoveries, and was fathered by the adventurers whom they attracted to the diggings. This assumption is unfair to forgotten leaders of the thirties and forties, who created a small trade-union nucleus which never ceased to function, though unfavourable conditions often hampered its growth. Even during the twenties there were temporary combinations to obtain better working-conditions; in 1822 an attempt was made to organize convicts on an estate in the Liverpool district to secure higher wages and increased rations, but the

penalty inflicted on the ringleader—solitary confinement on bread and water for one month, 500 lashes, and re-transportation to a subsidiary penal station for the rest of his original sentence—was too severe to encourage further attempts of this kind. In June 1824 some coopers in Sydney 'combined and conspired' against their employers, and had to stand their trial for it. In 1828 English acts of 1824 and 1825 which repealed the combination laws were made effective in the colonies, so that trade-union organization was no longer unlawful—a fact of which compositors took advantage in the following year when they went on strike.

At this time the free working-class, a small minority of the labourers, was at a disadvantage owing to the assignment of convicts to private service. Assigned convicts, whatever their views on the industrial system might be—and presumably such convicts as those transported for machine-breaking in 1831 and the Dorchester labourers 'lagged to Botany Bay' in 1834 had strong views on the subject—were not in a position to refuse work. Moreover, the land-grant system that obtained before 1831 made the transition from artisan to landed proprietor comparatively easy. It was not until free land-grants were done away with, and assisted immigration was introduced during the early thirties, that conditions became favourable to the development of a permanent trade-union organization. In 1833 a cabinet-makers' society was formed to maintain piece-work prices in the furniture trade; in 1835 the typographists organized; in 1837 a 'systematic organized body' of seamen went on strike; in January 1840 the Phoenix society of tailors was formed; by this time, too, the building trades, the dominant group of operatives for many years, were organized. Altogether by September 1840 there were at least 10 trade-unions in Sydney; their membership has been estimated at between 30 and 40 members each—which is small, considering that in 1841 there were 10,715 mechanics and labourers in the colony, of whom 4078 were in Sydney. Whatever its membership, the trade-union movement was active enough to secure at short notice, with the support of a radical paper, the signatures of 3000 operatives to a petition against the masters and servants act of 1840. These small trade societies maintained 'houses of call,' organized strikes, and contributed to radical newspapers; some were also associated with benefit societies, or accumulated their own benefit funds. They concerned themselves with questions of wages and apprenticeship, consistently opposed the assignment of convict labour and the importation of coolies, and were unfavourable to assisted immigration on a large scale; for instance, on 16 March 1839 the trade-council of Sydney compositors complained to the compositors of Great Britain that Sydney master-printers had been circulating inaccurate reports abroad concerning the wages obtaining in the colony, with a view to encouraging the immigration of compositors. By 1840, according to the *Sydney Gazette*, 'the striking mania seems to be gaining ground in Australia.' The police committee had in 1839 drafted an amended masters and servants bill to extend the provisions of an act of 1828 (which regulated time-work labourers on farms and estates) to include all labourers, whether on piece-work or time-work. The penalties against a labourer for breaking his contract were as heavy in the draft bill as in the earlier act; a labourer convicted by a justice of the peace of refusal to work, or of doing unsatisfactory work, might be sentenced to six months' imprisonment. When in September 1840 this bill was presented to the legislative council, the operatives of the town protested so effectively that they were able (with the support of such middle-class opinion as the *Australian* then represented) to secure a considerable modification of the penalties—the accused on conviction by two or more justices might be required to forfeit his wages and to pay a sum not exceeding twice the amount of any damage incurred by his employer by his action, or in default undergo three months' imprisonment. As in Great Britain, employers in the colony seem to have preferred to take action under this act rather than under the trade-union acts of 1824-5 against employees who broke engagements.

The passing of the masters and servants act of 1840 convinced unionists that the workers required political representation as well as industrial organization, and they assisted a 'liberal' candidate at the election of 1843, who was, however, defeated at the poll; later in the same year they co-operated with others to form a 'mutual protection association,' which published an organ, *The Guardian*, from March to October 1844. But times were bad. Assisted immigration had been carried on at a rapid rate during 1840-1, and, though most of the immigrants were absorbed, wages showed a tendency to fall and unemployment to increase even before the financial crisis of 1842-3 ushered in a general depression. In these circumstances working-class organization seems to have broken down. Strikes were sporadic and generally unsuccessful. Many mechanics left Sydney for Port Phillip and Adelaide—where wages were higher—or went overseas. Towards the end of the forties there was a revival, and during the fifties there was a rapid extension of the trade-union movement among the skilled trades in the towns. The Typographical Association was formed in 1851, the Amalgamated Society of Engineers in 1852, the Operative Stonemasons' Union in 1853, the Australian Society of Progressive Carpenters and Joiners in 1854, in which year a mercantile seamen's union and a tailors' union were also in existence. Later followed the organization of plasterers, bricklayers, shipwrights, bakers, and coal-miners.

The influence of English trade-union thought and activity on this colonial development is evident throughout the period. An interesting example of this is the formation of the Amalgamated Society of Engineers, the first meeting of which (on 8 October 1852) was held on shipboard by immigrants. As in England, union leaders during the fifties endeavoured to secure a reduction of hours (see EIGHT-HOUR SYSTEM). Other causes of dispute also arose; in 1854 the printers of the *Empire* newspaper disagreed with the owner, Henry Parkes (q.v.), about the form in which notices of the government land-sales should be printed, and went on strike without giving notice. The strikers were sentenced to short terms of imprisonment, it being held that they could not do as a body an act (leaving without notice) which it was illegal for them to do as individuals. During the same year printers who left the government service as the result of a wage dispute proposed the publication of a labour organ. At public meetings and delegate meetings from trade-unions the publication of a weekly paper, the *Operative*, on a co-operative basis, was discussed; the paper's policy was to include a better general education

and higher wages for workers, and an agitation against the flooding of the colony with cheap coolie labour (see IMMIGRATION RESTRICTION). But the *Operative* survived only a few months; the union movement was still weak, and dissensions were rife.

An effort to secure preference for unionists was made by the Newcastle coal-miners in 1861, but after a 6-weeks' strike they returned to work under former conditions. The movement was prejudicially affected by a gold-rush at the beginning of the sixties, which was followed by industrial dislocation and depression during the rest of the decade; it was not until the revival at the beginning of the seventies that trade-unionism in New South Wales, and indeed throughout Australia, took firm root.

Meanwhile the early movement in the other colonies had followed much the same lines as in New South Wales. In *Victoria* a strike of carpenters and joiners occurred in 1840; in 1844 the 'mechanics of Port Phillip' congratulated the Mutual Protection Association of Sydney on the publication of the *Guardian*; in 1850 an Operative Stonemasons' Society was formed, and a Typographical Association in 1851. But the gold discoveries acted as a disruptive force, and, when the first gold-yields began to fail, the labour-market was swamped and an industrial depression followed. But the first signs of a social and industrial settling-down gave a stimulus to trade-unionism; towards the end of 1855 there appeared a weekly paper, the *Democrat*, which strongly supported the cause of the working-man. During that year, too, the Operative Stonemasons' Society was reorganized, and other branches of the building trades were organized or strengthened about the same time. In 1856 an operatives' board of trade, consisting of representatives from unions connected with the building trades, was constituted to act as a board of advice to the unions in case of conflict with the employers; this board functioned for five or six years. Under English influence the stonemasons, who were in constant communication with the English stonemasons' society, took the lead in the eight-hour struggle in Victoria. In 1857-9 there were frequent trade disputes and a number of strikes, chiefly on the eight-hour issue, strike-leaders being occasionally prosecuted under the local masters and servants act. The trade-union movement was also strongly opposed to assisted immigration, and is partly responsible for the vacillating immigration policy of those years (see MIGRATION). When, for instance, the masons learned towards the end of 1858 that railway contractors had announced in England that employment could readily be found in Victoria for 1000 masons and 2000 navvies, their union wrote in haste to the English union contradicting this report, and forwarding £50 for the engagement of a lecturer to 'dog the (contractors') agent about from place to place.' In 1859 a number of masons, with the approval of the union, formed a co-operative association and took contracts, paying current wages to its members and dividing surplus profits equally between them; they successfully carried through a large contract for the construction of Pentridge prison at a cost of £47,000. Two other co-operative groups of masons were formed later, but owing to disputes with the union on the question of piece-work the experiment terminated, and the influence of the union declined. The carpenters seem to have followed the example of the masons in co-operative experiment, but without the same initial success. The Victorian movement suffered from the depression of the sixties, though not to the same extent as that of New South Wales; organization extended with the industrial revival at the end of the sixties and the development of manufacturing industries.

In *South Australia* the first noteworthy instance of a combination of workmen occurred early in 1846, when the tailors formed a union and were successful in demanding increased wages; in June 1846 the boot-and-shoe-makers formed a society to regulate the rate of wages; in 1848 there was an extended dispute at the Burra Burra mines on a wage-question in which both carters and miners were involved. In 1851 the gold-rush to Victoria set in, and was followed by a depression during which a move was made to decrease wages; the unions on their part made a counter-demand for a reduction in hours. Members of the building trades struck work in August 1854 against a threatened wage-reduction, but were unsuccessful. In 1863 a public meeting was held in Adelaide to demand shorter hours of work, representatives of the stonemasons, carpenters, and plumbers taking a prominent part; but even at this date the trades were feebly organized, if at all, and were not strong enough to carry the eight-hour issue to a successful conclusion. A stronger union nucleus was formed when the copper-miners at Wallaroo (which was opened up in 1859) and Moonta (1861) organized. In April 1864 there was an extensive and successful strike at Moonta on a question of wages and management; shortly afterwards, however, the miners at Wallaroo were beaten on a similar issue. Affiliated with the miners' societies was a 'political association' formed in August 1866 to oppose the policy of assisted immigration, and generally 'to place the whole question concerning labour fairly before the public, especially at the time of municipal and parliamentary elections.' The miners' unions, however, lost much of their strength before the eighties.

In *Queensland* workers had some loose organization before 1 March 1865—when the first annual demonstration in favour of the eight-hour principle was held—and about this time there were in existence small unions in connection with the building trades; but not until after 1872-3 was much progress made in trade-union organization. In *Western Australia* there was no movement towards labour solidarity during the early years, labourers preferring to leave the colony rather than attempt to improve their conditions in it. In *Tasmania* whatever organization was effected during the thirties and forties was broken down by the abnormal conditions that resulted from the flooding of the colony with convicts.

The seventies and eighties were years of trade expansion and general industrial development throughout Australia; rising wages and falling prices improved the general standard of living, and shorter hours gave the workers the leisure necessary to take advantage of this change. Local craft-unions expanded in all the eastern colonies, and took root in Tasmania—and after 1887-8 in Western Australia, where previously there was only a carpenters' union, formed in 1884. In 1874 the seamen—whose previous efforts at combination had lacked permanence—reorganized their forces in Sydney and Melbourne, and were strengthened by the successful outcome of the 1878 strike (see STRIKES). The wharf-labourers and others also organized, and in 1884 a Sydney Maritime Council was formed

to represent unions connected with the shipping industry, but soon ceased to be effective. In 1872 a gold-miners' association was formed in Bendigo, followed by similar associations in other centres; in 1874 these separate unions were combined to make the Amalgamated Miners' Association. After 1882, when W. G. Spence became general secretary of the A.M.A., an attempt was made to link it up with the unions of coal- and copper-miners (formed before the seventies) by means of an intercolonial council that should deal with large issues and arrange financial assistance in case of need; the Broken Hill silver-miners were also organized in 1887 as a branch of the A.M.A., but close co-operation between all mining groups was found difficult.

During this period unionism was introduced into the pastoral industry of the eastern colonies. After several unsuccessful attempts, the shearers' union of Victoria was formed in 1886, and soon extended to include the shearers of New South Wales and South Australia—shearers being a migratory group who 'follow their job' from colony to colony. In the same year the Queensland shearers formed a union, and the shed-hands organized in 1888, the two bodies amalgamating in 1891 to form the Amalgamated Workers' Association of Queensland. This organization in the pastoral industry was developed on an industrial, not on a craft, basis.

In 1891 there were 124 unions in Australia, 72 of which had a membership of 31,871; the estimated total union membership was 54,888. Up to that time, therefore, trade-unionism, though established in all the principal industries, was still on a small scale, and the number of non-unionists must have been very large. Development was to some extent facilitated by the passage of legislation modelled on the English trade-union act of 1871 (amended in 1876) and the associated conspiracy and property act of 1875. Under the trade-union act combination was legalized; the objects of a union were declared no longer unlawful merely because they were in restraint of trade; provision was made for the registration of unions, which were given protection for their funds against defalcating officers and were empowered to hold property —but legal action could not be taken to recover dues, fines, etc. from members, or benefits for them from the unions. A trade-union act on English lines was passed in South Australia in 1876, in New South Wales in 1881, in Victoria in 1884 (with an amendment in 1886), in Queensland in 1886, and in Tasmania in 1889. Western Australia did not pass a similar act until 1902.

As the craft-unions grew, central delegate bodies in the cities began to appear and intercolonial congresses to be held. The Sydney trades and labour council was formed in 1871. About this time also was organized a trades and labour council in Melbourne, which became a tenant of the trades-hall committee (formed in 1856 to secure a central meeting-place for the various trade-unions and to act as a committee of management of the property); from one or both of these bodies was developed, about 1883, the trades-hall council, to which unions were asked to affiliate. During 1883 central councils were formed in Brisbane and Hobart, and in Adelaide in 1884. In Western Australia a central body was set up in 1891 to deal with matters of general interest; but it was little more than a council of the building trades, and after a year or so a more representative body was formed.

The first intercolonial trade-union congress was held in Sydney in October 1879, at the instance of the Sydney trades and labour council; the other colonies, not being prepared to incur the expense of sending delegates, arranged for representation through local unions. To the second congress (in Melbourne in 1884) all the colonies except Western Australia and Tasmania sent delegates. There followed congresses in Sydney in 1885, Adelaide in 1886, Brisbane in 1888, Hobart in 1889, and Ballarat in 1891, at which all the colonies except Western Australia were represented. Until the Adelaide congress delegates confined their attention to the strengthening of the workers' position in the existing industrial system—for example, the agenda at the first congress included discussions on immigration, extension of the eight-hour principle, the legalization of trade-unions, the regulation of factories and workshops, workmen's compensation, and education. In 1886 took place the first discussions concerning the taxation of land-values; at Brisbane in 1888 the question of nationalizing all instruments of production was openly debated. This change resulted from a wide, newly-aroused interest in the writings of Henry George and Bellamy, and synchronized with a similar development in Great Britain—where within a decade from 1885 the whole trade-union movement was permeated with collectivist ideas. Australian trade-unionism was still too weak and divided (all attempts at closer organization having failed) to effect any such change by industrial action, and congresses became increasingly more interested in direct political representation.

In 1870-90 the unions had shown a readiness to use direct industrial means to obtain their objects, and there is a long record of strikes. The causes of dispute varied, wages and general conditions always taking a prominent place. Sutcliffe gives a list of strikes for shorter hours, including a 9-weeks' strike of ironmongers in Sydney in 1873, as a result of which an eight-hour day was recognized for the trade; strikes of Victorian tanners and beamsmen in 1875, of Brisbane dock-labourers in 1876, of Hobart carpenters and joiners in 1877, of operative bakers of Sydney in 1884—all for an eight-hour day. In connection with the tanners' and beamsmen's strike some strikers who had failed to give notice were prosecuted for a breach of the masters and servants act, and sentenced to three months' imprisonment without the option of a fine. The Hunter River District Coal-miners' Association, who had secured a wage-increase in 1872, decided that after January 1873 the members would only work 10 hours a day, and were locked out for several weeks; the dispute ended in a compromise, 10½ hours being fixed for 1873 and 10 for 1874. A strike of miners at Clunes in 1873, which arose in the first place from the men's refusal to work a Saturday afternoon shift, led to an attempt by the employers to secure Chinese to work the mines; the introduction of cheap Asiatic labour has always occasioned bitterness between the parties, and there was considerable disturbance at Clunes. The employment of Chinese labour was also responsible for the seamen's strike of 1878.

Though the unions used the strike as a weapon, it was evident to many of their leaders that it was an expensive method of settling a dispute. Experiments were therefore made with 'councils of conciliation' like those proposed by English trade-union leaders to the

house of commons committees of 1856 and 1860, and actually established in many English industries between 1867 and 1875. The settlement of a dispute by conciliation was tried in Melbourne in the boot trade in 1884, representatives (not directly connected with the dispute) of the employers' union and of the trades and labour council being appointed to confer upon it. During the Melbourne wharf-labourers' strike in 1886, a similar body, but with an independent chairman—a university professor—was appointed, and was locally referred to as a 'board of arbitration.' Following the successful settlement of this dispute a permanent board of conciliation was appointed by the trades and labour council and the employers' union, to which industrial questions might be referred for settlement without recourse to strikes; the decisions of the board were to be accepted by both parties. A similar scheme was drawn up by a joint committee of the New South Wales employers' union and the Sydney trades and labour council, but apparently was not put into operation; however, a representative board of conciliation was appointed for the New South Wales building trades, and is said to have done useful work. In South Australia a board of conciliation, composed of representatives of employers and employees, was also established during the eighties. At the intercolonial trade-union congress of 1889 it was said that boards of conciliation and arbitration were becoming more common as recognized institutions, and it was agreed (though not unanimously) that they should be legalized; 'the evils resulting from strikes and lockouts are such that it should form part of the duty of every trade-unionist never to resort to them without having first offered arbitration.'

In 1887 a trades conciliation bill providing for the establishment of voluntary machinery for conciliation was introduced into the New South Wales parliament, but was not passed; another scheme was proposed in Victoria; in South Australia a bill to encourage the formation of industrial unions and associations and to facilitate the settlement of industrial disputes was introduced in 1890, but did not pass until 1894. Meanwhile in 1891 the Victorian parliament had passed a bill providing for voluntary councils of conciliation, and this was followed by the New South Wales trades conciliation and arbitration act of 1892. But all these early measures were defective, and were only taken advantage of to a very limited extent, if at all, during the nineties. Unionism had suffered a great set-back through the complete failure of the maritime and shearers' strikes in 1890-1, and the leaders were convinced that industrial action alone could not effect a permanent improvement in the workers' conditions. They decided, therefore to step boldly into the political arena, and developed what is generally known as the 'new unionism.'

It must not be thought that unions in the past had had no political interests. Reference has been made above to the political association affiliated with the miners' groups in South Australia during the sixties, and similar working-men's political associations were formed in the various colonies at different times, especially before an election. According to Sutcliffe these were not as a rule directly connected with the trade-union movement, though the personnel of the political and industrial groups was often the same. There were isolated instances of working-men being sent to parliament with union assistance—e.g. when Angus Cameron was elected in New South Wales in 1875 the trade-unions paid his election expenses and an allowance during his parliamentary term. Miners' unions also took action to secure the passage of legislation regulating the conditions of their employment—the Amalgamated Miners' Association of Victoria drafted a bill, most of which was incorporated in the regulation of mines and machinery act of 1877. In 1884 the second intercolonial trade-union congress agreed to urge upon the unions the necessity of appointing a parliamentary committee in each colony 'to assist in passing through parliament measures for the benefit of labour and where possible to obtain labour representation in parliament.' A committee on these lines was forthwith formed in Victoria, and during the same year the Sydney trades and labour council established a similar committee; others were formed later in Queensland, South Australia, and Tasmania by central delegate bodies. It was the business of the committees to take an active interest in any legislative proposal likely to affect labour, and they both drafted bills and recommended amendments to bills before the house. Largely owing to the influence of these committees measures affecting factories and workshops, electoral reform, employers' liability, and payment of members' acts were passed, and assisted immigration was suspended. On occasion they also supported parliamentary candidates who sought their favour, but their attempts at securing direct labour representation did not succeed. At Hobart in 1889 an electoral platform was decided upon, and during the nineties political labour parties came into existence (see LABOUR PARTIES). Except in Queensland, where a scheme of labour federation had been adopted, union organization was not well suited to political campaigning; moreover it was generally agreed that membership of the Labour party must be wider than that of the trade-union movement if success was to be achieved. The result was the gradual organization in each State of a distinct Australian Labour party, to which the trade-union movement handed over its political functions. At the present time the political and industrial organizations are distinct in all the States except Western Australia, the relationship between the two differing in different States.

In view of the Utopia which, it was anticipated, political labour would establish, the trade-union leaders set themselves merely to secure as favourable conditions as possible for the workers under existing industrial relations; this no doubt accounts in large part for the conspicuous lack of Australian experiments along the lines of co-operation or representation on boards of management. During the present century the chief duty of trade-union leaders has been to represent their unions before the arbitration courts (see INDUSTRIAL LEGISLATION) or, failing the peaceful settlement of disputes, to safeguard the interests of their members during strikes.

During the nineties, owing to general industrial depression and disastrous strikes, the trade-union movement lost much of its strength, employers being able to enforce freedom of contract and ignore the unions when making agreements with their employees. The intercolonial trade-union congress held at Adelaide in 1898 was attended by only 31 delegates, of whom 24 were from South Australia, 6 from Victoria and 1 from New South Wales. But since federation there has been a rapid extension in trade-union organization, fostered by an arbitration system

under which only organized bodies, whether of employers or of employees, can approach the courts; this is true also in States which have preferred the wages board method, as employees have found it necessary to organize to appoint representatives to the boards. The movement now includes on the one hand the least skilled workers, on the other the professional groups—public servants, municipal, banking, and insurance employees, etc. There has been a marked trend towards amalgamation of associated groups within each State and towards federation of unions belonging to the same industry in the several States. Care must be taken, however, to avoid confusion between trade-unions as such (registered under trade-union acts) and industrial unions or organizations (registered under arbitration acts), especially in the federal sphere. Trade-unions may federate, but there is no Commonwealth trade-union act, and no provision is made for the registration of unions as federal entities save under the Commonwealth conciliation and arbitration acts. Hence a federal union when de-registered by the arbitration court has no recognized status; its branches in the States, however, may be separately registered under the State trade-union acts. Special provision was made by the Commonwealth industrial peace act of 1920 for the coal-mining industry, the miners having rejected the existing arbitration practice. It cannot, therefore, be assumed that statistics of unions registered under the trade-union acts represent the strength of industrially organized labour in Australia. Owing to the complications arising from this dual system, the Commonwealth bureau of census and statistics has since 1913 secured independent figures of organizations performing the functions generally recognized as those of a trade-union. These returns show a tendency to closer organization, since, though the membership of unions in 1924 had increased 72 per cent on 1912 figures, nevertheless the number and membership of unions with a membership of 10,000 each or over represented 52 per cent of the total union membership. In 1925 there were 104 interstate or federated trade-unions with branches in two or more States, their membership totalling 642,993. Without allowing for duplication in the case of interstate unions, the bureau in 1925 estimated the number of unions in Australia to be 743, with a membership of 795,722; of these members 699,399 were males and 96,323 females. The estimated total number of employees 20 years old and over was estimated at 1,200,592 males and 286,053 females.

Various attempts have been made to effect closer co-operation in the trade-union movement, with a view to centralizing control both in the States and on a federal basis. At present a central body functions in each State, its executive powers being determined by its constitutional relations with the constituent unions. In New South Wales recently an attempt has been made to strengthen the powers of the central body—the trades and labour council—by bringing it into closer relation with the unions. To this end the affiliated unions have been arranged in 12 groups (sea and land transport, manufacturing, building, etc.) each of which appoints a member to the executive committee of the council. It is considered that the council under the new arrangement will be able to rely on more support than, say, the council in Melbourne, the members of which are appointed by an annual conference. Representatives of State labour councils at interstate congresses held in 1902, 1907, and 1913, appointed committees to consider the possibility of organizing a federal labour council with a constitution and executive functions. At the 1913 congress agreement was reached; in 1914 the executive committee of a federal grand council of labour met in Melbourne, and the grand council itself in April 1915. In the following year a conference of representatives of the State councils and of the more important unions agreed to extend the powers of the council (which were limited by the 1913 agreement to dealing with disputes extending or likely to extend beyond the limits of any one State, and with matters referred to it by State labour councils). They were extended to include 'the administration of and giving effect to congress decisions, and the performance of such acts as they shall deem to be in the best interests of forwarding the objectives of this body.' But the federal council was at no time very active, and had little control over its constituent members; unions, indeed, are divided on the point whether closer organization shall be achieved by federation—as the craft-unions wish—or by amalgamation. The first powerful industrial group was the Australian Workers' Union, which gradually absorbed all pastoral and agricultural unions, an amalgamation being effected in 1913 with the Rural Workers' Union, the Amalgamated Workers' Association (Queensland), the Australian Carriers' Union, and the Amalgamated Rabbit-trappers' Union. The new organization was registered under the Commonwealth arbitration act, and arrangements were subsequently made for admitting other unions. The Australian Workers' Union in 1914 took over control of the Queensland *Worker*. About the same time tentative proposals were first made to establish a 'One Big Union' in Australia. The dissensions of the conscription campaign harmed labour's political prospects; at the same time it was becoming evident that arbitration could not prevent strikes on a large scale, while it hindered industrial amalgamation by creating sectional interests in particular awards. An impetus was therefore given to the 'One Big Union' scheme; at a conference of sympathizers held in Sydney in August 1918 a programme was drawn up, and a propaganda committee appointed, but the response of the unions was weak. In February 1922 a conference of delegates from the Australian Workers' Union, the Waterside Workers' Federation, the Australian Railway Union, and the Coalminers' Union agreed that their unions should become departments of the One Big Union, and appointed a provisional general council. A conference held in 1923, however, made no progress, disagreements arose, and the organization was not proceeded with; political labour re-asserted itself, and the O.B.U. scheme lost support. A Commonwealth labour council, on the lines of the federal grand council of 1916, but with wider executive powers, was instituted in 1925, but Western Australia, which does not approve of the separation of political and industrial issues, is not represented on it.

The strike function of trade-unionism has been somewhat restricted in Australia by anti-strike legislation, which obtains in all the States except Victoria. In New South Wales the industrial arbitration act of 1912 declares illegal all strikes directly involving public servants or employees in an industry regulated by an award, and any strike at all unless 14 days' notice has been given to the minister, who may require a ballot to be taken; it is also forbidden to take

any part in an illegal strike, and, in any strike, to declare goods, etc. 'black.' In Queensland the industrial arbitration act of 1916 makes it illegal to declare a strike unless the union members by ballot first approve it. In South Australia the industrial code of 1920 forbids lockouts, strikes, and picketing. In Tasmania the wages boards act of 1920 forbids lockouts or strikes in any case where a wages board has made a declaration. The Western Australian industrial arbitration act of 1912 (amended by No. 45 of 1920) also contains anti-strike legislation. Under the Commonwealth conciliation and arbitration acts strikes and lockouts extending beyond the limits of any one State are forbidden to industrial organizations registered under the provisions of the acts. For the effects of all this legislation see STRIKES.

The legal status of trade unions in Australia has also been modified by the arbitration system. Unions registered under arbitration acts (State or Commonwealth) as industrial unions or organizations have for the purpose of the acts a legal entity, may sue, be sued, and recover subscriptions and fines from members. Further, trade-unions registered under State trade-union acts have been affected by judicial decisions, and in New South Wales and Queensland by subsequent legislation; the Victorian trade-union act of 1915 is merely a consolidating act, and the Western Australian trade-union amendment act of 1924 is unimportant. Soon after the decision in the English 'Taff Vale' case (*Taff Vale Railway Co. v. Amalgamated Society of Railway Servants*, 1901, A.C.426) that the union concerned, though admittedly not a corporate body, could be sued in a corporate capacity and restrained not merely from criminal acts but also from unlawfully causing loss to other persons, a test case (*Keogh v. Australian Workers' Union*, 1902, 2 S.R.265) was brought before the New South Wales courts; the judge held that the A.W.U. stood in exactly the same position (as far as regards liability for the acts of its servants or agents) as the defendant society in the Taff Vale case. He did not agree with the defendant's plea that a union registered under the New South Wales arbitration act, 1901, received an immunity from liability for the acts of its servants and agents except by order of the arbitration court. In 1917, in *Egan v. Barrier Branch of the Amalgamated Miners' Association and others* (17 S.R.243) it was held that a trade-union was a quasi-corporate body and might be sued in its registered name for a tort committed by its agents in connection with the objects for which the union was constituted. Presumably this is the status of all trade-unions in Australia registered under the early legislation, which was modelled on English acts of the 1870s. By the New South Wales industrial arbitration act of 1912 a trade-union is empowered to apply its property for any lawful object authorized by its rules—including political objects—so long as payments for such objects are made out of a separate fund, contributions to which are not a condition of membership; unions are also given power to sue members for fines, levies, or penalties provided for by the rules. In Queensland the objects of trade-unions were restricted by a legal decision in 1911, and some of the largest unions cancelled their registrations; an act of 1915 considerably modified the status of unions, assimilating it to that now enjoyed by unions in Britain. Provision is made for the registration of unions if their principal objects are statutory—the regulation of relations between workmen and employers (or between workmen and workmen or employers and employers), the imposing of restrictive conditions on the conduct of any trade or industry, and the promotion of the welfare of members. Kindred organizations also may be helped, political objects furthered, and newspapers established, out of union funds. Actions are not maintainable against unions or their officials in respect of any tortious act done on behalf of the union—but this does not affect the liability of union trustees; at the same time a union may bring an action against a member for the recovery of dues. The act also makes it lawful for one or more persons, acting in contemplation of or during the continuance of any industrial dispute, to picket for the purpose of obtaining or communicating information. In the other States it has apparently not been thought worth while to amend the early trade-union acts, as many unions are not registered under them.

See Coghlan's *Labour and Industry in Australia*; Sutcliffe's *A History of Trade Unionism in Australia*; *Labour Reports* issued periodically by the Commonwealth bureau of census and statistics; Spence's *Australia's Awakening*; and, for the English background to Australian trade-unionism, Webb's *The History of Trade Unionism*.

Traglin. See TERAGLIN.

Tramways. See RAILWAYS AND TRAMWAYS.

Transportation. This form of punishment, by which a prisoner was removed from his homeland to some specified destination, there to be held in bondage for a specified period, was introduced into English penal law during the 17th century. The system under which transportees were sent to the American colonies in the 18th century was determined by an act of 1718, which gave to the person who contracted to transport them a property interest in their services during the period of sentence; the contractor was thus enabled to sell them by auction as bondsmen, for the term of their sentence, to employers requiring labour. Thus British society rid itself of its more turbulent elements, and at the same time supplied labour for the new colonies. Both this system of enforced service for private masters and the subsequent Australian system of enforced service for the local government—with their attendant conditions of barrack life, transportation in crowded and often insanitary vessels, and temporary subjection to the power of autocratic and sometimes conspicuously unfit officials—contrast unfavourably with the modern treatment of criminals, and are frequently used to support charges of brutality and callousness made against the British people. In truth they were probably the most humane systems of penological treatment then practised. The lot of the British prisoner, once sentenced by a court of law, was until the 1840's always pitiable and sometimes horrible according to present-day standards; but the lot of such prisoners in other European countries was far worse, and in many cases is worse to-day; blackeners of Britain's reputation in this regard may profitably study the recent records of punishment camps in several States of North America. It was the spirit of the age, not of the nation concerned, that originated the evils with which this article must deal; and the fact that British public opinion was so soon and so

greatly shocked by their disclosure is evidence of the true national ideal.

After the outbreak of the American war of independence the British authorities were obliged to consider some other method of punishment. It was at first decided to place prisoners sentenced to transportation on hulks under charge of a contractor, the convicts being 'in the eyes of the law on their way to America.' But conditions on the hulks were disgraceful beyond measure; when the loss of the American colonies was admitted, a scheme for the erection of penitentiaries and confinement under close discipline in England was therefore drafted and sanctioned. Alarmed at the extensive building and sustenance costs which this scheme would involve—or interested for other reasons in extending British colonial interests—certain persons advised the planting of a new colony for the reception of prisoners. At first a site in Africa was suggested, but in 1779 Joseph Banks recommended to a house of commons committee Botany Bay on the coast of New South Wales, and the advantages of this site were emphasized by James Matra (q.v.) in 1783. In 1784 the advocates of transportation (as against penitentiaries) secured the passage of an act which authorized the government to select some place beyond the seas for the reception of convicts from Great Britain. Two orders-in-council, issued in December 1786, nominated for this purpose the eastern coast of Australia and the adjacent islands, and in May 1787 the 'First Fleet' (q.v.) left for New South Wales. On 31 October 1804 the colonial office informed Governor King that the authorities in India had been empowered to transport to New South Wales persons (presumably Anglo-Indians) convicted of transportable offences, and in 1811 Macquarie was directed to receive persons transported under similar conditions from Ceylon.

As New South Wales had no already settled white population, transportation at first involved labour for a period of years in the service of the crown. Contractors were obliged to hand over to the governor on arrival the indents of prisoners in their charge at sea, and thus the private sale of convict labour never obtained in Australia. Phillip's additional instructions of 20 August 1789 empowered him, however, to assign a convict to any other person (see ASSIGNMENT SYSTEM). The crimes punishable by transportation were determined by statute, and, as the gallows became more unpopular with juries, transportation was gradually substituted for hanging in serious felonies. In P. Colquhoun's *A Treatise on the Police of the Metropolis* (5th edn., 1797, p. 286) is given the following list of:—

Crimes denominated Single Felonies; punishable by Transportation, Whipping, Imprisonment, the Pillory and Hard Labour in Houses of Correction according to the Nature of the offence: the principal of which are the following:—

Grand Larceny, which comprehends every species of Theft above the value of one shilling not otherwise distinguished
Receiving or buying Stolen Goods, Jewels and Plate
Ripping and stealing Lead, Iron, Copper etc., or buying or receiving
Stealing (or receiving when stolen) Ore from Black Lead Mines
Stealing from Furnished Lodgings
Setting fire to Underwood
Stealing Letters, or destroying a Letter or Packet, advancing the Postage and secreting the Money
Embezzling Naval Stores, in certain cases
Petty Larcenies, or Thefts under one shilling
Assaulting with intent to Rob
Aliens returning after being ordered out of the kingdom
Stealing Fish from a Pond or River—Fishing in inclosed ponds, and buying stolen Fish
Stealing Roots, Trees, or Plants of the value of 5s. or destroying them
Stealing Children with their apparel
Bigamy or Marrying more Wives or Husbands than one (now punishable with transportation)
Assaulting and Cutting, or Burning Clothes
Counterfeiting the Copper Coin, etc.
Marriage, solemnizing clandestinely
Manslaughter, or killing another with Malice, etc.
Cutting or Stealing Timber Trees etc. etc. etc.
Stealing a Shroud out of a Grave
Watermen carrying too many passengers on the Thames, if any drowned.

'Incorrigible rogues' who broke out of prison, and persons reprieved from capital punishment, were also transported. Colquhoun does not include in his list offences against the game laws, which sent a good many persons to New South Wales during the industrial depression of the early 19th century; many who took part in the hunger-riots and machine-breaking of 1830 were also transported.

Most transported convicts were sentenced under this code; there was, however, another class of convicts, sentenced in the main for sedition, who were considered undesirable citizens because of their political or social views and activities—yet many of them were intelligent and upright in character, and advocated reforms that are to-day considered part of the British democratic system. Information concerning the 'Scottish Martyrs' transported in 1794 will be found under MUIR, THOMAS. Another historic group was that of the six Dorchester labourers, who were sentenced in March 1834 for administering an oath in connection with a recently formed agricultural trade-union—a sentence which 'came like a thunderbolt on the Trade Union world;' there was agitation in England against their sentence, in 1835 they were granted conditional pardons, and were repatriated in 1838. During the early years of the settlement, and again after the insurrections of 1848 and 1867, Irish political prisoners (see IRISH EXILES) were also transported to Australia.

The report of a select committee on transportation (1812) gives a clear account of the system then in operation. Not all convicts sentenced to this fate were actually obliged to suffer it. In England those first selected when a transport was chartered were the life-sentence men, then those serving 14 years, and others serving 7 years who proved turbulent on the hulks. Later, when the demand for assigned servants in the colonies increased, most of the seven-year men were sent, and occasionally some who had almost completed their sentence in England. Hardly any convicts suffering from serious infirmity, and few over the age of 50, were sent out. When a 'female transport' was taken up, women were collected from the houses of detention in the different counties, and medically examined before embarkation; it was customary to send out all women sentenced to transportation, unless they were medically unfit. From Scotland prisoners with sentences under seven years were not exempt from transportation, as Scottish law did not specify time limits. In Ireland, when it was decided to send out convicts, reports were called for from the county gaols, no hulks being in use; the judge who tried each case was asked whether the sentence might be mitigated; and a medical examination was held of the convicts whom it was decided to transport. This examination does not

seem to have been efficient, as protests were made at times by the colonial governors against the sending of aged and infirm transportees from Ireland.

No provision was made for the repatriation of convicts when their sentence expired; those who did return to Great Britain either paid their way or worked their passage, or (if women) returned as prostitutes to the ship's crew. Except for convicts with life-sentences, no provision was at first made to enable a convict's wife and family to follow him to the colony; but in 1812 the committee on transportation recommended further facilities, and Bathurst informed Macquarie that provision would be made for women recommended as industrious and of good character to join their husbands. An experimental group of 10 women was sent out at public expense. The governor was also instructed to receive applications from convicts or emancipists who were in a position to support a family, and a number of lists were forwarded to England; but the authorities were disinclined to incur the risk of having to maintain these persons in the colony, and the practice does not seem to have developed to any great extent.

The secretary of the transport office, giving evidence before the 1812 committee, explained the procedure followed when instructions came through from the treasury to take up a vessel. Tenders were called for the outward run only, the East India Company usually chartering convict ships for the return journey. It was the practice to accept the tender showing the lowest price per ton, even though this meant taking up a larger vessel than was actually required for convicts; the vessel was filled up with stores or by accommodating private passengers. The owners provided the navigating officers and crew and an approved surgeon. In 1802 the admiralty suggested that it would be better for the government to fit out transports and put naval officers in command, the return freight being made up of timber—then much in demand at the navy yards—and other articles which might be produced in New South Wales. In accordance with this suggestion H.M.S. *Glatton* was fitted up, and reached Sydney with convicts on 11 March 1803; but apparently the experiment was not continued (owing, perhaps, to the exigencies of war or to the difficulty of securing sufficient freightage home) and a return was made to the contract system. A guard, at first of marines but later of soldiers, was put on board each transport to keep the convicts in order, usually one officer and 30 men being provided for 200 male convicts. Provisions and clothing for the convicts during the voyage, and for some months after landing, were supplied by the government victualling board. The scale of rations—which, under the terms of the charter-party, were served out by the master—provided, in 1812, for each mess of six male convicts per week 20 lb. bread, 12 lb. flour, 16 lb. beef, 6 lb. pork, 12 pints peas, 1 lb. butter, 8 oz. rice, 1½ lb. suet, 3 lb. raisins, 6 pints oatmeal, 4 oz. sugar. The master was also authorized to secure fresh vegetables, etc., at ports of call. Convicts before going on board were required to strip off all clothing and don the regulation dress provided for the purpose. The colonial medical authorities considered that this dress, though adequate when vessels left England in the warmer months, was a hardship to convicts embarking during the winter, as the admiralty for hygienic reasons did not approve of the issue of flannel or woollen materials; efforts were therefore made to dispatch vessels during the warmer months.

It was customary for the colonial secretary or his deputy to muster convicts in each vessel on arrival, and hear any complaints, and after 1801 regular reports of the conduct of officers had to be sent to England. Enquiries into the conditions of any particular voyage were also instituted by the colonial governors when special circumstances seemed to demand it. The mortality rate, which had been very satisfactory on the First Fleet, was high on the second, the *Neptune* losing 158 out of 502 convicts (male and female), the *Surprize* 36 out of 256, and the *Scarborough* 73 out of 259. The treatment meted out by master and crew in the *Neptune* was described by the colonial office as a 'shocking calamity,' and to avoid enquiry the master absconded on his return to England. Most of the deaths were caused by scurvy and 'low fever.' During 1795-1801, of 3833 convicts embarked 385 died. This high rate was largely due to the outbreak of typhus in the *Hillsborough*, which arrived at Port Jackson on 26 July 1799 with 'a cargo of the most miserable and wretched convicts I (Hunter) have ever beheld.' Out of 300 male convicts embarked 95 were lost on the voyage, and others died shortly after landing; Hunter complained that they had been put on board with no clothes besides those in which they stood, and arrived 'naked' at a time when the public stores were empty. From 1801 to 1814 the mortality rate was reduced, but in the latter year a series of untoward incidents occurred which led to an important change in the control of convicts at sea. On 7 February 1814 the *General Hewitt* arrived with its convicts in a weak condition, 34 having died at sea; the *Three Bees* followed in May with a large number of aged and infirm Irish: on 28 June the *Surry* arrived after a wretched voyage during which typhus broke out—the second occasion on which a transport brought this disease to the colony—causing the death of 36 convicts, the master, surgeon, 1st and 2nd mates, seven seamen, and a sergeant and three privates of the military guard. At the inquiry the typhus epidemic was shown to have been aggravated by the callous conduct of the officers in not allowing the convicts to come frequently on deck—a complaint that was made against several transports during the period. Meanwhile the colonial surgeon William Redfern (q.v.) had been asked by the governor to report on conditions in the *General Hewitt*, and to recommend improvements in the convict service; his report, submitted on 16 March 1814, after pointing out the dangers attendant on close confinement (which not only deprived the convicts of fresh air but made it impossible for their quarters to be properly ventilated and cleansed) and the scarcity of fresh water, stated that the ships' doctors were mostly incompetent, being either students fresh from the lecture-room or men who had failed in their profession; moreover, they received little courtesy or assistance from the masters, who were usually men without education or refinement. He suggested, therefore, that naval surgeons, experienced men with an official status, should be appointed to transports by the government. He found also that masters used improperly their power of serving out the rations, and suggested that the naval surgeons should also act as government agents to see that masters fulfilled their charter-obligations. (As early as 1797 Hunter had suggested that a naval officer, or some other properly qualified person, should

be put aboard to protect convicts against ill-treatment; this suggestion had not been adopted.) After 1815, therefore, naval surgeons were appointed to transports; they were required to attend to the care and management of the convicts, and to see that the master fully complied with the terms of the charter-party; they were to be careful that the convicts received their due rations, that the food was properly cooked and regularly served, and that sufficient water was supplied for the use of all. This change had satisfactory results. On 1 March 1816, Macquarie wrote that in the first four transports under the new scheme all the convicts were in excellent health and had no complaints to make.

The only other misfortune at sea that need be mentioned was a suspected mutiny in the *Chapman*, which arrived from Ireland on 27 July 1817; it is important as illustrating the special character of Irish transportation. There had been trouble in the *Britannia*, which arrived from Ireland on 27 May 1797 with its convicts in a very indifferent state of health; they were suspected of making plans to take the ship, and were consequently kept in irons during the whole voyage. In the *Anne*, which arrived from Ireland in February 1801 (some of the convicts had been embarked without any pretence at a proper trial), there had been a rising which was only overcome with difficulty. When the *Chapman* arrived, Macquarie appointed a special court of inquiry to investigate charges of 'cruelty and oppression' against officers, surgeon, and guard. The vessel sailed from Cork on 14 March 1817 with 200 male convicts; some of them had been brought round from Dublin in the *Atlas*, whose master warned the officers of the *Chapman* that the convicts 'were a turbulent, desperate and dangerous set of men.' Consequently only 12 were allowed on deck at a time during the voyage, and only the sick were permitted to remove their irons; they were constantly under suspicion, and on three occasions the prison was fired into, 12 convicts in all being killed, and a large number wounded and left unattended for hours. Severe corporal punishment and other cruelties were practised upon these 'unoffending men, loaded with irons, closely confined and strictly guarded.' A plea of insurrection was made in justification of the severities adopted, but Macquarie was not convinced that any serious danger need have been apprehended. He proposed to send home under arrest the master, three mates, the surgeon-superintendent, and the officer commanding the military guard; but the judge-advocate opposed this course in view of the evident suspicions and fears entertained by the ship's company against the Irish. It was therefore decided to send back three privates on specific charges of murder; the surgeon-superintendent and military officer were also embarked under close military arrest, and 10 soldiers and 14 convicts (all of whom had to be released before giving evidence in England) were sent as witnesses. The hypothecation of the ship was also taken, to secure the surrender of the master and mates on arrival in England if required. Macquarie did not think these measures would suffice for effectual justice, but hoped 'that sufficient may be effected at least to protect the persons of convicts in future on their passage hither from the cruelties and violence to which they have been heretofore in a certain degree exposed chiefly owing to the rude and boisterous description of men who generally command merchant ships . . . .' However, everyone sent for trial was acquitted, 'it appearing to the court and jury upon the evidence that the conduct of the convicts on board the *Chapman* was of a nature to excite in the minds of the officers and crew such an apprehension of danger as could excuse at least, if not justify, the several acts of homicide laid to their charge.'

As a general rule female convicts were brought out in separate transports, and were allowed free access to the deck during the day. But no efforts on the part of the authorities succeeded in protecting them from prostitution to the officers and crew, and this trouble persisted during the whole era of transportation. Apart from this difficulty, few complaints were made of transport conditions after the twenties, and minor changes introduced by the admiralty (e.g. the separation of juvenile quarters from those of the adults, modification in the dietary scale, etc.) added to the general well-being.

Life on board a transport in the twenties has been described by a surgeon-superintendent who during four voyages had charge of over 600 male and female convicts, all of whom reached port (see Cunningham's *Two Years in New South Wales*, 1827, vol. ii, p. 215):—

> Before leaving the hulk, the convicts are thoroughly clothed in new suits and ironed; and it is curious to observe with what nonchalance some of these fellows will turn the jingling of their chains into music whereto they dance and sing. Two rows of sleeping-berths, one above the other, extend on each side of the between-decks of the convict ship, each berth being six feet square, and calculated to hold four convicts, every one thus possessing eighteen inches space to sleep in—and ample space too! The hospital is in the fore-part of the ship, with a bulk-head across separating it from the prison, having two doors with locks to keep out intruders—while a separate prison is built for the boys, to cut off all intercourse between them and the men. Strong wooden stanchions, thickly studded with nails, are fixed round the fore and main hatchways, between decks, in each of which is a door with three padlocks, to let the convicts out and in, and secure them at night. The convicts by these means have no access to the hold through the prison, a ladder being placed in each hatchway for them to go up and down by, which is pulled on deck at night. Scuttle-holes to open and shut for the admission of air, are cut out along the ship's sides; a large stove and funnel placed between decks, for warmth and ventilation; swing stoves and charcoal put on board, to carry about into the damp corners; and in fact every thing that can be thought of provided to secure health and proper comfort to the convicts during their voyage. Each is allowed a pair of shoes, three shirts, two pair of trousers, and other warm clothing on his embarkation, besides a bed, pillow, and blanket—while bibles, testaments, prayer-books, and psalters are distributed among the messes.
>
> The rations are both good and abundant, three-quarters of a pound of biscuit being the daily allowance of bread, while each day the convict sits down to dinner off either beef, pork, or plum-pudding, having pea-soup four times a week, and a pot of gruel every morning, with sugar or butter in it. Vinegar is issued to the messes weekly, and as soon as the ship has been three weeks at sea, each man is served with one ounce of lime-juice and the same of sugar daily, to guard against scurvy; while two gallons of good Spanish red wine, and one hundred and forty gallons of water, are put on board for issuing to each likewise—three to four gills of wine weekly, and three quarts of water daily, being the general allowance. The sick are in like manner provided with all requisite medicines and comforts, as well as with warm dresses, spare bedding, sheets, and every description of hospital furniture.
>
> The common diet of the convicts is certainly more than is requisite to keep them in health, as they have no work to do; but it is not more

than is politic to allow them; because if you stint them on the voyage, you must keep them under greater restraint, and their healths will suffer in consequence. Two delegates, chosen in rotation from the several messes, daily see the provisions weighed out, and justice done to the whole body in that particular.

An excellent account of a similar voyage from the point of view of a free passenger will be found in the *Monthly Magazine* for April 1823.

No regularity was observed in the despatch of transports, vessels being taken up according to the exigencies of the moment. When the opening up of sheep-runs in New South Wales created a great demand for labour, convicts were sent out at more frequent intervals, but there was a temporary suspension in 1831 owing to the reports of bushranging episodes. In 1788-99 the annual average was 380 males and 99 females; in 1830-39 it was 3593 males and 514 females.

During the thirties English criticism of transportation increased in vigour, and in November 1837 a select committee of the house of commons was appointed to inquire into 'its Efficacy as a Punishment, its Influence on the Moral State of Society in the Penal Colonies, and how far it is susceptible of Improvement.' The committee reported in August 1838 that the two main characteristics of transportation as a punishment were 'inefficiency in deterring from crime, and remarkable efficiency not in reforming, but in still further corrupting those who undergo the punishment; that these qualities of inefficiency for good and efficiency for evil, are inherent in the system, which therefore is not susceptible of any satisfactory improvement; and lastly, that there belongs to the system, extrinsically from its strange character as a punishment, the yet more curious and monstrous evil of calling into existence, and continually extending societies, or the germs of nations, most thoroughly depraved, as respects both the character and degree of their vicious propensities.' The committee was therefore of opinion that transportation should be abolished, and that there should be substituted for it compulsory labour in penitentiaries, to be established at home and abroad. The shorter sentences should be served at home as soon as the necessary buildings could be provided; the penitentiaries to be established abroad 'ought (so far as possible) to be strictly limited to those places wherein there are at present no free settlers, and wherein effectual security can be taken against the future resort of such settlers, and the convicts who have been there punished should be compelled to leave these settlements within a certain period after the expiration of their sentences.' They recommended Norfolk Island and Tasman's Peninsula as sites for penitentiaries, which should be built to suit both the silent and the separate systems of discipline. Most of the opposition to transportation at this time came from critics in Britain; in the colonies the artisans, who were obliged to compete with assignees, opposed the system and were supported by other town-dwellers, but the squatter-party, which was still dominant in colonial affairs, favoured it as a source of cheap labour. Nevertheless an order-in-council abolishing transportation to New South Wales was issued on 22 May 1840, though convicts continued to arrive until the following year. The new system, under which the convict-stream was diverted to Tasmania and Norfolk Island, is explained under CONVICTS. The total number of convicts transported to New South Wales and Tasmania in 1788-1840 was 88,250, of whom 76,612 were males and 11,638 females. See MACONOCHIE, ALEXANDER.

As suggested by the select committee, two penitentiaries (Parkhurst—chiefly for juveniles—and Pentonville) were established in England to reform the short-term prisoners, and to teach them some trade which would later be useful in society. Incorrigible offenders were weeded out for transportation. It was, however, found very difficult to place the men thus reformed after they had served their time, and the home office considered that they would have a better chance of good employment and respectable companionship if they were sent to the colonies. On 10 January 1843 Stanley enquired of Gipps whether it would be possible to find openings in Australia for juveniles from Parkhurst, if they were sent out as free emigrants—or, if younger boys, as emigrants under short indentures. A few had already gone to Western Australia and New Zealand under these conditions, but it was thought that the Port Phillip district would offer the best advantages for the boys. Latrobe (q.v.) favoured the proposal, but the executive council of New South Wales considered it inexpedient, and it was not then proceeded with. A more serious difficulty had presented itself to the authorities. It had been anticipated in England that the demand for labour in Tasmania (which was still a penal colony) would continue to be in excess of the number of convicts sent out. It was hoped, too, that 'exiles' (Pentonville prisoners pardoned on condition of exiling themselves from England until their original sentence expired) would find openings there as free labourers; indeed, they were encouraged to good behaviour by a definite promise to this effect. But Tasmania was swamped before the mid-forties, and the British authorities, anxious to avoid a breach of public faith, determined to make openings for the exiles on the mainland. Stanley still favoured the Port Phillip district, and in 1844 made an agreement with a local resident to place 21 exiles in positions there; but private undertakings of this kind were not big enough, and Gipps was informed that about 500 exiles would be sent out each year for placement as free labourers. The local authorities would, Stanley thought, be able to work out details better than those at home, and he decided to send the first consignment of exiles to Launceston to await instructions. If there was no immediate demand for their labour, he suggested that a temporary settlement might be formed on the coast of New South Wales, from which they could be transferred as openings were made; if they preferred to migrate voluntarily from the settlement, they would abandon all claim to maintenance. In case it was found necessary to establish a settlement, a tentative agreement was made with surgeon-superintendent John Hampton (q.v.) to be surgeon and superintendent of the establishment; but such a settlement must only be temporary; for it was the policy of the government to place the men in free society. 'Her Majesty's government' said the despatch, 'hold it indispensable that within the Australian colonies receptacles should be found for all the convicts and exiles who may be sent from this country in execution of judicial sentences. This is so momentous an object of national policy that we can acknowledge no conflicting motive as of sufficient importance to supersede it.' On receipt of these instructions Gipps communicated with Latrobe, and it was decided to bring the exiles to Geelong, whence

they could be despatched to country engagements. The first batch of exiles was soon absorbed, but Gipps was not optimistic. Moreton Bay was the only district besides Port Phillip where any willingness to engage exiles was manifest. There had already been a hostile demonstration at Melbourne, and if the exiles gravitated to the towns this hostility would increase; experience, moreover, proved that they were not well-suited to country work. In December 1845 W. E. Gladstone took charge of the colonial office, and in order to relieve the Tasmanian situation decided to establish a convict colony in New South Wales north of 26° S. lat. (see GLADSTONE COLONY). Further, on 30 April 1846 he suggested to Gipps a conditional revival of transportation to New South Wales:—'It will be acceptable to H.M. Government if the members of the Legislative Council of the colony should shew a disposition to concur in the opinion that a modified and carefully regulated introduction of convict labourers into New South Wales or into some part of it may under present circumstances be advisable.' Towards the end of the 1846 session this despatch was referred to a select committee of the legislative council under the chairmanship of W. C. Wentworth; its report, submitted on 31 October, recommended that transportation should be revived, provided that no convicts were employed in gangs or assigned to positions in the towns, and that ticket-of-leave men also were confined to country districts. For each male convict sent out a female (either convict or free) should also be sent, and as many free migrants as convicts; 5000 convicts might possibly be absorbed annually. The report was forwarded to the colonial office without discussion in the council, but public meetings were called to protest against its recommendations, and on 13 September 1847 it was repudiated by the council at the instance of Charles Cowper. Meanwhile a change of ministry in England had altered the situation. The Gladstone Colony was abandoned. It was decided to remodel the penal system and divide each sentence into three periods, the first two of which were to be served in England and the third in the colonies:—(1) close confinement in a penitentiary, (2) employment on public works, (3) a conditional pardon or ticket of leave in the colonies. On 3 September 1847 Lord Grey notified Governor FitzRoy of the proposed change in penal discipline, stated his objections to assignment and work in gangs, and outlined the scheme under which ticket-of-leave men would be sent out to the country districts; exiles would only be sent occasionally, as it was considered advisable to retain some control over the convicts until their original sentences expired. Facilities would be given to the wife and family of a convict to rejoin him, and as many free migrants as convicts would be despatched. Before ticket-of-leave men could be transported to New South Wales, however, it was necessary to issue an order-in-council proclaiming the colony a place to which convicts might be sent; this was done, and the first two transports, the *Hashemy* and the *Randolph*, reached Sydney and Melbourne respectively in June and August 1849. So great was the public outcry against the revival of transportation that FitzRoy deemed it advisable to have most of the ticket-of-leave men sent on to Moreton Bay, where labour was in demand, and subsequent transports were instructed to proceed to that district. Only about 2000 convicts were introduced into New South Wales under Grey's scheme. Despite the eagerness of the squatters to procure labour, and the anxiety of the British authorities to improve their penal system, it was found unwise to persist in a policy which roused such public hostility among the colonial townsfolk. Artisans, sons of convicts, philanthropists, political reformers banded together as anti-transportationists, associations being formed in Sydney, Melbourne, Adelaide, and Launceston to terminate all transportation to eastern Australia (including Tasmania); in February 1851 an intercolonial meeting was called at Melbourne (at which only the Victorian and Tasmanian associations were represented) to form an Anti-transportation League, the members of which pledged themselves never to employ convicts and to resist their importation by all constitutional means. The various associations became provincial councils of the league, and a representative was appointed in Great Britain. In consequence of the agitation the transportation of ticket-of-leave men to New South Wales—even to Moreton Bay—was suspended in 1850, but the colonial office would not promise to abolish transportation to eastern Australia. When this news was received a meeting of protest was called at Sydney by the league in April 1852, at which prominent speakers suggested separation from Britain unless the British authorities yielded. Meanwhile the Victorians had been suffering from an influx of conditionally pardoned men from Tasmania, who were said to be largely responsible for an alarming outbreak of crime during the gold-rush. Panic legislation was passed through the new legislative council, on the lines of a draft bill drawn up by the Anti-transportation League forbidding the entry of such men from Tasmania; all persons arriving from that colony were to be considered convicts unless and until they proved otherwise. This bill was vetoed by the crown, but before news of the veto reached Melbourne it was known that the British authorities had yielded; the last transport to Tasmania was despatched towards the end of 1852. The total number of convicts sent to Tasmania in 1841-52 was 35,378.

The only colony which received Grey's proposals favourably was Western Australia (q.v.), and in 1850 the first batch of convicts arrived at Fremantle. After the cessation of transportation to Tasmania, Western Australia became the only convict colony in Australia, so that the outflow of convicts from Britain was necessarily restricted. To meet this situation an act of the British parliament substituted for transportation in certain cases shorter sentences to be served in penitentiaries at home. The shortened sentence, adopted because it was thought that discipline in penal establishments at home was more punitory than transportation, was objected to in some quarters, and in 1856 a committee was appointed by each house of parliament to enquire into the operation of the act. The house of commons committee reported 'that the punishment of transportation is more effectual and deterring, better adapted for the ultimate reformation of convicts and more beneficial to this country than any other secondary punishment for serious crimes which has yet been tried.' The house of lords committee reported much to the same effect, a continuance of the system of transportation being considered 'highly desirable, provided that the system can be carried on with advantage to the colony and with satisfaction to the colonists.' They therefore considered possible places to which convicts might be sent in addition to Western Aus-

tralia. Moreton Bay was ruled out. Although that district had petitioned for convicts in 1850, and again in 1852, it was learned that by 1856 the squatters had made terms with the anti-transportationists of Brisbane on the separation issue, and had surrendered their claim to convict-labour. The committee pointed out, however, that in the event of a new convict settlement being formed, northern Australia—and especially the country at the head of the Gulf of Carpentaria recently opened up by Leichhardt—offered special advantages. 'The climate, in spite of the latitude, appears not ill-adapted to European constitutions; the soil is fertile; and while it is not so near the peopled settlements of New South Wales as to give cause for alarm or awaken jealousy on their part, it is sufficiently within reach to hold out the expectation that free settlers might ere long follow in the wake of such an establishment, and supply the means of profitable employment to the convicts.' Witnesses from Moreton Bay were of opinion that no considerable opposition would be roused in Australia if a settlement were formed north of the Burdekin River, and it was pointed out that Dr. Lang, a leader in the anti-transportation movement, had in *Freedom and Independence* (1852) approved of transportation to northern Australia. Lord Grey opposed the formation of a new settlement as expensive and inexpedient; he still believed that by judicious negotiation it would be possible to send out ticket-of-leave men under engagement to employers, especially in the northern districts. But the problem of transportation was solved by the extraordinary decrease in crime in Great Britain after the mid-fifties. In Ireland the number of persons committed for trial decreased by three-quarters during the period 1849-56; and in 1858-61 it was found impossible to supply Western Australia with more than an average of 300 convicts annually, though the colony was prepared to take 1000. This change was attributed to the general increase in prosperity, and to the effect of penal reforms instituted at home. The home office was not anxious to continue transportation, except perhaps on a small scale for a few long-sentence men. The colonial office was opposed to it; 'in every point of view' the assistant under-secretary informed the house of lords committee, 'I think that transportation as a system has come to an end and that its day has passed.' The eastern colonies of Australia complained of the movement of conditionally pardoned men from Western Australia to their ports, and South Australia and Victoria introduced restrictive legislation—it was acknowledged that about 1400 convicts had disappeared from Western Australia. No new settlement was established, and in 1861 another committee of the house of commons made a report showing the continuous diminution in crime and in the length of sentences, but suggesting the continuation of transportation to Western Australia on the then-existing small scale. The committee would not admit that the eastern colonies suffered appreciably from transportation to Western Australia. The system was finally terminated in 1868.

This article should be read in conjunction with CONVICTS.

Trawling and Fisheries. 1. TRAWLING.—Until the advent of the State-owned steam trawlers in New South Wales in 1915, there was no commercial trawling established in any waters of Australia. For many years the possible development of ocean fisheries in this way had been much discussed, but very few believed in it. In 1898 a small steamer, the *Thetis*, carried out some experiments with the 'otter' trawl—a bag-shaped bottom-fishing net, in which the mouth was kept open by two large boards or 'doors' known as otter-boards. Although the *Thetis* was of quite unsuitable build, and could not work a commercial trawl net, her experiments (carried on for a few weeks only) revealed, at least to the specialist, that with suitable vessels and proper gear the ocean fisheries could be successfully exploited. The experiments were made upon a small stretch of the New South Wales coast-line between Manning River and Jervis Bay, and in depths ranging from 10 to 80 fathoms.

In 1909 the Commonwealth government built and equipped the s.s. *Endeavour* for work in general sea-fisheries investigation. Between that year and 1915 this vessel, under the charge of H. C. Dannevig, made experimental cruises along portions of the southern, eastern, and western coasts of Australia. Trawling grounds of much potential value were discovered. While the work of the *Endeavour* produced results of great biological interest and importance, she was not suited for the successful operation of a full-sized commercial otter-trawl net; consequently many of the richest grounds (including those nearest to Sydney) were passed over, and her catches afforded but little indication of the commercial possibilities; however, a large proportion of the fishes taken were immature. Her inability to fish successfully with commercial gear was due to her faulty design, which caused a large trawl to play 'ducks and drakes' along the bottom. Her most useful work was probably performed in the Great Australian Bight, where incomplete investigations revealed valuable trawling areas at 60-100 fathoms.

In 1914 the New South Wales government determined to explore the possibilities of ocean fisheries in the most modern way, and appointed D. G. Stead a special commissioner to examine and report upon the commercial fisheries of Great Britain, Europe, and America. Upon his recommendation it authorized the building of three modern steam otter-trawlers of the 'Castle' type at Middlesbrough-on-Tees, England, at a cost of £22,000. These—the *Bro'ga*, *Koraaga*, and *Gunandaal*—were very strongly-built vessels, suited for operating in the roughest seas and able to work the trawl on both sides. The *Brolga* was 117 ft. in length between perpendiculars; the others were 2 ft. shorter, with a very shallow draft forward and of about 15 ft. aft, a moulded depth of 12 ft. 8 in., and a breadth of 22 ft. The tonnage was 216 gross, 82.57 net. Triple expansion engines, using 'Scotch' boilers, developed 80 h.p. The vessels were equipped with powerful double-barrelled trawl-winches, the *Brolga* carrying 1000 fathoms on each drum and the others 800. Special attention was paid to the insulated holds, so as to improve on the prevailing North Sea methods and adapt the vessels for use in warmer waters.

Trawling operations were begun in May 1915, and within a short time highly productive fishing-grounds had been discovered on the New South Wales coast. Allowing for seasonal variations, the catches on these grounds have remained consistently rich over a period of 11 years, and they now rank among the very richest in the world, equalling those of the coasts of Iceland and the best portions of the White Sea. Many cruises have given a return of 1000-

1200 lb. of marketable fish per fishing hour. Under European or Asiatic conditions of sale the average would have been increased by large quantities of a kind and size not at present saleable in Australia.

The two principal grounds isolated were (1) an area of about 200 square miles reaching from off Sydney Heads southwards to a point in the vicinity of Wollongong; (2) a prolific patch of some 300 square miles from about Merimbula southwards to a point a little to the north of Cape Howe. The former of these was named the 'home' grounds, and the second the 'southern' grounds. Investigations showed that there was no real line of demarcation between these grounds and the areas between, and that, instead of the bottom being (as had been imagined) generally rock-strewn with a few open areas, the whole area was fishable, though with rock patches here and there. The best results were obtained in depths ranging from 30 to 75 fathoms. The most prolific grounds were found to be separated by reefs and rock outcrops, and these had to be carefully charted, since they occasioned, in the early stages of the work, much loss of gear. Such losses are, however, but the natural concomitants of early exploratory work; and this fact should be remembered by those who may be developing areas at present unworked. Curiously enough, the greatest losses of gear occur on areas contiguous to the best grounds, but this is equally the case with the trawling-grounds of Iceland or the White Sea.

All the initial stages of this work were carried out by the three trawlers mentioned; but shortly afterwards the New South Wales government decided to prosecute the business on a much larger scale, and, as part of a scheme for improving the condition of the fisheries in general, ordered four more steel trawlers of the same general design as the others to be built at the government dockyard at Newcastle. At the same time it was decided to construct a number of fish-collecting and refrigerating stations at points along the coast, and, as a link between these and a great central receiving-depot at Sydney, a refrigerated fish-carrying vessel was built. About the same time a mixed fishing-vessel—capable of carrying out trawling, drift-netting, and general investigation of marine fisheries—was also ordered by the government. This vessel (the *Bar-ea-mul*) was intended primarily for investigation work and was much larger than any of the others (136 ft. between perpendiculars).

The great war gravely interfered with the development of the industry, and it was not till 1920 that the four new steel vessels (*Goorangai, Goonambee, Dibbiu,* and *Dureenbee*) were in commission. In the meantime (1919) the *Bar-ea-mul* had been completed and sold to the Queensland government for fisheries investigation in the northern waters, and the fish-carrier *Colliboi* had just been placed in commission and had entered upon its fish-transport work.

The young industry was also seriously hampered by a lack of continuity in policy, due to changes of ministries and governments, while, in the war days, the trawling and investigation work was badly interrupted by the vessels being taken for mine-sweeping on the Australian coast. Yet, notwithstanding such handicaps and the loading of capital outlay by over £100,000 through war costs alone, the vessels continued to carry out their work, and rich harvests were brought in to the markets of New South Wales.

As part of its policy, government had opened distributing depots for fish throughout Sydney and suburbs as well as at various places in the country, and for several years some millions of pounds weight of fish were brought to the homes of the public, many of whom had never previously been able to purchase fish with any regularity.

In 1920 a change of government policy closed the coastal depots, which, while not expected to 'pay' in the ordinary commercial sense, were intended to, and did, save the large quantities of fish that would otherwise be wasted, through irregular transport, at important centres like Clarence River and Port Stephens. The fish-carrier was then sold to the Tasmanian government. The changes wrought by this government were injurious to the industry, and that which followed in 1923 decided to terminate the undertaking as a State-owned concern and to dispose of the vessels and other assets.

Trawling had, however, been carried on for so long that business men were at last awakening to a recognition of the vast field for enterprise in these seas. Though two of the vessels had been sold to New Zealand, after two years' absence they were bought back into New South Wales; others also were purchased. Later the investigation vessel sold to Queensland was purchased by a Sydney group and was added to the fleet working out of that port. On 12 August 1926 the trawler *Brolga*, the pioneer of the greatest development in Australian fisheries, was wrecked on Beware Reef off the coast of Victoria while returning to the New South Wales off-shore fishing-grounds after having sold a 'fare' of 800 baskets in the Melbourne market.

At the present moment the deep-sea fisheries are being continued by a fleet of seven trawlers and one old and heavy mine-sweeper recently converted to the purpose. No trawling is conducted anywhere else in Australia, but arrangements are in progress for the starting of operations from Melbourne, and in due course the work will doubtless spread to other centres.

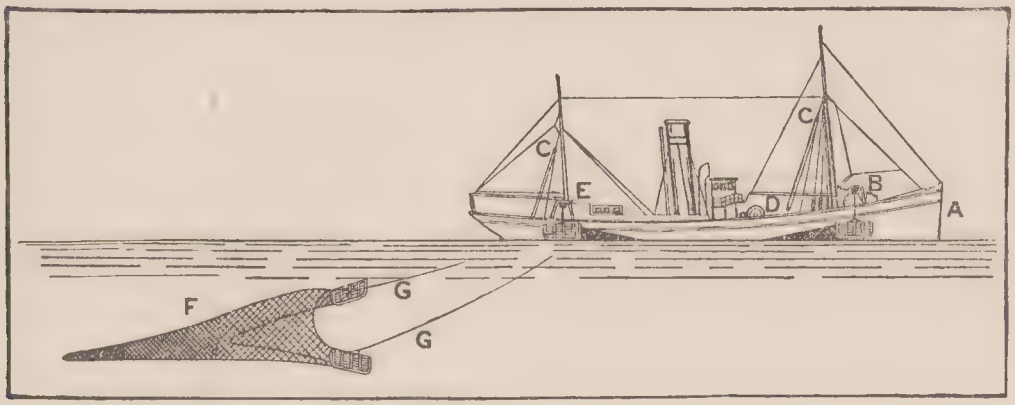
The work of the New South Wales trawlers, here briefly described, has exerted a profound influence on the development of Australian fisheries. Not only has the actual amount of fish so added to the public supply been vast, but, with the fillip given to fish-eating, the in-shore fishermen have found a demand for kinds of fish (such as rays) which were previously unsaleable. This influence is even exerted upon the fish supply of Victoria and Queensland, where 'trawled skate' is frequently sold—in places where there is no trawling.

Trawling with the otter trawl (especially with wing extensions of the net) is a highly economical form of fishing, altogether apart from the fact that the ground worked is new. One vessel employing 12 hands can do the work of 300 fishermen using ordinary in-shore fishing-gear.

An immense development of trawling may be expected in Australian waters. In northern parts the vast shallow sea off the coast of the Kimberley district of Western Australia and Arnhemland (Northern Territory) should prove the most productive and also highly remunerative because of the proximity of a great Asiatic and Malayan market.

One of the best features of fisheries development by trawling is that a practically new fish fauna is dealt with; thus there is no interference with the estuarine fisheries, which have naturally been the first to be developed in Australia. In the trawling operations already described the fishes taken in greatest abundance were of kinds which were previously seldom or never seen in

the market-place. The most important numerically have been Tiger Flathead (*Neoplatycephalus macrodon*), Sharp-beaked Gurnard (*Pterygotrigla polyommata*), Red or Kumu Gurnard (*Chelidonichthys kumu*), Yellow Leather-jacket (*Cantherines ayraudi*), Jackass-fish, i.e. Silver Perch or Bastard Dory of Tasmania (*Dactylopagrus macropterus*), Morwong (*D. morwong*), John Dory



Steam trawler, showing otter trawl ready for shooting.

B—Fore gallows; C,C—Blocks for assisting to heave trawl on board; D—Steam winch; E—After gallows; F—Trawl net in process of "setting"; G—Towing-warps leading to towing-block, thence over gallows rollers.

(*Zeus faber*), Barracouta (*Thyrsites atun*), Nannygai (*Trachichthodes affinis*), Sea Perch of various kinds, a small Sawfish (*Pristiophorus cirratus*), and several species of Skate or Sting-ray.

D.G.S.

2. General Fisheries.—In *New South Wales*, although the trawlers have added considerably to the available fish-supply, the bulk of marketed fish is captured by other means, principally in the estuaries, rivers, and sheltered ocean beaches. Several types of nets are used, the most important being the hauling-net (seine) and the meshing-net. The hauling-net is worked either from the shore or from a 'back-net' set in shallow water; one end is attached to a fixed object, the net is payed out from the stern of a rowing-boat as it circles round the fish till the shore is again reached, and both extremities are then hauled simultaneously. The meshing-net is a stationary net placed across the track of a shoal of fish; they endeavour to pass through it and are enmeshed by the gill-covers. The meshing-net is used largely in the capture of Sea Mullet (*Mugil cephalus*) when they are schooling from March to May. The garfish-net is a hauling-net of fine mesh, used in the capture of several species of garfish; the prawn-net, another modification of the hauling-net, is weighted to hold the bottom. Two valuable species of prawn, the School Prawn (*Penaeopsis macleayi*) and the King Prawn (*Peneus plebejus*) abound in many estuarine waters. The trammel-net, adapted for use on rough ground, is but rarely employed, and neither the drift-net nor the purse-seine, both employed extensively in other countries in the capture of pelagic fishes, has been introduced into Australian waters, though good, edible, surface-swimming fishes are known to abound off the Australian coast during certain seasons of the year.

Professional fishermen make great use of hand-lines and long lines over rocky ground off-shore. The hand-line is the principal source of supply of the best market fish found in Australian waters, the snapper; the groper (see Wrasses) is also taken principally by this means. The catch (whether of line or net) is packed in wooden boxes with broken ice, transported (usually to Sydney) by rail or steamer, and auctioned there by commission agents in a central market controlled by the Sydney municipal council.

The commonest fishes in the Sydney market are the tiger flathead (trawled), sea mullet, blackfish, black bream, snapper, jewfish, Murray cod, kingfish, leather-jacket (trawled), and the dusky flathead. Among estuary fish the sea mullet is most plentiful and from March to May frequently gluts the market. The snapper consistently brings the highest price—from 6d. to 2s. per lb. wholesale.

The total quantity of fish marketed in New South Wales during 1925 was 179,404 cwt. valued at £430,569. Of this amount 38 per cent consisted of trawled fish, and less than 1 per cent of freshwater fish from inland centres. The Clarence River estuary is the most prolific net-fishing ground on the coast, about twice as much fish being marketed from that river as from any other in the State; the output from this source in 1925 was 19,703 cwt. Over 2000 fishermen and oystermen are employed along the coast, using boats and gear valued roughly at £140,000; and about 8000 drum-nets are used in the capture of the Murray cod and other freshwater fishes. Fair quantities of fish are smoked, the mullet, blackfish, and tailor being most in demand for that purpose.

Within the scope of New South Wales fisheries are included the capture and marketing of crayfishes, prawns, and crabs, and the cultivation and sale of oysters. During 1925 8478 dozen crayfish (*Jasus verreauxi*) were marketed, as well as large numbers of boiled 'southern' crayfish (*J. lalandi*), imported from Tasmania; during the same year were marketed 9206 cwt. of prawns (school prawns predominating), and 505½ dozen crabs, chiefly blue swimming-crabs and mangrove-crabs. The artificial propagation and acclimatization of trout is of importance, 392,844 fry being distributed in New South Wales during 1925.

In *Victorian* waters trawlers have not operated commercially, though the *Endeavour* demonstrated that extensive banks carrying large supplies of good edible fish exist at convenient distances from Melbourne. The bulk of the fish that supplies the Melbourne market is captured with hauling- and meshing-nets; hand-

lines are also used, particularly for sea flathead, barracouta, and snapper. Long lines are used in Port Phillip Bay for snapper and rock ling (red cod) during the winter months. The most important food-fishes marketed in Victoria are the barracouta, black bream, flathead, flounder, garfish, luderick (the blackfish of the Sydney markets), Australian sea salmon, snapper, silver trevally, and spotted whiting.

The total quantity of fish captured in Victorian waters during 1925 was 41,011 cwt., valued roughly at £134,010; this total does not include the freshwater fishes such as Murray cod. Small quantities of fish (mainly barracouta) are smoked or cured.

In *South Australia* most of the commercial fishing is done with hauling-nets, meshing-nets, and hand-lines; long (set) lines are rarely, if ever, used. The fishes captured in greatest abundance are the spotted whiting, school whiting, snapper, butter-fish or mulloway (the jewfish of the Sydney markets), flathead (dusky and sand), flounder, garfish, groper, nannygai, and sea salmon. Fairly heavy supplies of Murray cod and callop (the golden perch of the Sydney market) are also received from the Murray River.

In *Queensland* hauling-nets of various meshes (regulated by the fisheries act) are used for the capture of estuarine fishes, and the hand-line for off-shore species—principally rock fish. The Brisbane market absorbs most of the supply. Net-fishing procures most of the whiting, bream, garfish, tailor, mullet, flathead, and dewfish (the jewfish of the Sydney market); snapper, parrot-fish, sweetlips, red rock cod, black cod, red emperor, pearl perch, and mackerel are taken by hand-lines.

During 1924-5 56,820 cwt. of fish were sold, valued at £124,379. One trawler, bought from the New South Wales government in 1919, operated in Queensland waters from May 1919 to February 1922, but was financially unsuccessful, and was resold to a private company in Sydney. A good deal of fish is smoked, the principal species being mullet, tailor, and mackerel. A cannery in active operation at the Nor' West Islet (about 40 miles from Rockhampton) manufactures turtle-soup of good quality which commands a ready sale. Another turtle cannery is in course of erection at Heron Island in the Capricorn group. The turtles (*Chelone mydas*) are captured on adjacent beaches, where they go to deposit their eggs. The season is from October to about April of each year.

In *Western Australia* fisheries are dependent on the hauling- and meshing-nets for the larger estuarine and river species; garfishes and prawns are caught by small-meshed hauling-nets, the dimensions of net and mesh being restricted by regulation. Ocean-fishing is done with the hand-line—occasionally the long line is used. Hand-line fishing is an important branch of the industry, from 6000 to 9000 cwt. of snapper and jewfish, q.v., (not to be confused with the jewfish of New South Wales) being captured in the neighbourhood of Geraldton alone. The most important market fishes are snapper, jewfish, bream, tailor, sea mullet, whiting (several species), short-finned pike, skipjack (the trevally of the eastern States), and river kingfish (the jewfish of New South Wales). Complete records of the quantity captured annually are not compiled, but the total value probably amounts to upwards of £76,000. Fremantle and Perth are the main distributing centres; large quantities of fish are also landed at centres such as Albany, Bunbury, and Geraldton, and railed direct to country towns. Trawlers have not operated commercially in Western Australian waters, though extensive and well-stocked grounds suitable for trawling are believed to exist, particularly off the southern shores of the State. Only small quantities of fish are smoked or cured, mainly mullet, tailor, and roughy (also known as sea herring). Approximately 550 men are employed regularly in the fisheries.

In *Tasmania* the nets used are the hauling-net and the meshing-net (known locally as the 'grab-all'), the former being employed chiefly in the estuary of the Tamar for mullet, salmon, and flounder, the latter for trumpeter, etc. Hand-lines are employed both in estuaries and off-shore, where the principal species captured is the Tasmanian trumpeter. The most important food-fishes marketed are the Tasmanian trumpeter, bastard trumpeter, black-and-silver perch (the jackass-fish of New South Wales), flounders, small-scaled rock cod, common rock cod (the rock ling of the Melbourne market), red rock cod, and barracouta. Most of the catch is brought to the main distributing centre, Hobart, alive in the wells of the fishing-boats.

Although good edible fish exist off-shore, the grounds have never been accurately charted, and the recent introduction of a commercial trawler proved an unsuccessful venture, as the large number of reefs caused an extensive loss of gear. Further surveys appear necessary if suitable trawling-grounds are to be accurately located. Barracouta are extensively smoked, and considerable quantities exported to Australian ports. There is also a large export trade in boiled southern crayfish, and large numbers of live crayfish are carried to Melbourne in the wells of the fishing-boats.

See T. C. Roughley's *Fishes of Australia and their Technology* (Sydney, 1916). T.C.R.

Tree-creepers, small arboreal birds belonging to the family Certhiidae, represented in Australia by the genus *Climacteris*, which is peculiar to the Australian region. Australian tree-creepers are blackish-brown or rufous-

Red-browed Tree-creeper (*length* 6 *in.*).

brown birds, more or less mottled, with a fawn-coloured band across the wing, which is conspicuous when they fly. They have rather long, slender bills, curved downwards, and long toes with long, curved, sharp claws. They are insectivorous, climbing upwards on tree-trunks to

extract insects from the crevices of the bark, or hopping along the ground or over fallen boughs. Their habit of pecking at the bark has given them in Australia the name of woodpeckers; but they are not related to the true woodpeckers (Picidae) of other parts of the world, which are unaccountably absent from this continent.

The creepers build soft nests of grass, fur, or feathers in hollows in the trees, and lay three pinkish-brown eggs, blotched with reddish-brown. Their notes are loud and piercing, and are frequently uttered whilst climbing.

Seven species occur in Australia; the best-known are the Brown Tree-creeper (*C. picumna*) of eastern Australia, the White-browed Tree-creeper (*C. superciliosa*) of southern Australia, the Rufous Tree-creeper (*C. rufa*) of South and Western Australia, and the White-throated Tree-creeper (*C. leucophaea*) of eastern Australia and Tasmania. W.B.A.

Tree-ferns. See FERNS.

Tree-kangaroos, an aberrant genus (*Dendrolagus*) of the kangaroo type, adapted to life in tropical forests; they differ from ordinary kangaroos (*Macropus*) in having the fore- and hind-limbs more nearly equal in development, as in ordinary quadrupeds. The hind-feet are relatively broad, the second and third toes not so greatly reduced as in terrestrial kangaroos, and the claws of the fourth and fifth toes strongly curved. The tail is very long, and covered thickly and evenly with fur.

Tree-kangaroos were first found in Papua, where three species have long been known—the Black Tree-kangaroo (*D. ursinus*), the Brown Tree-kangaroo (*D. inustus*), both described in 1839, and Doria's Tree-kangaroo (*D. dorianus*), described in 1883. Since then ten species have been described. It was not till 1872, during the Hann expedition to Cape York peninsula, that

Tree-kangaroo (*Dendrolagus matschiei*) from New Guinea.

tree-kangaroos were first definitely observed in Queensland, and not till 12 years later was the first of the Queensland species—the Bungary (*D. lumholtzi*)—actually described, an account of its habits being published shortly afterwards by Dr. Lumholtz, its discoverer, who found it on the Herbert River in northern Queensland. The second Queensland species, *D. bennettianus*, was described in 1886.

By the use of both pairs of limbs, with the aid of the tail—which, though not prehensile, is pressed against the branches and assists in supporting and balancing the body—tree-kangaroos are able to climb with ease and freedom; and, though able to progress actively on the ground after the fashion of an ordinary kangaroo, but with shorter leaps, they pass the greater part of their life in trees in the most inaccessible scrubs of mountainous forest country. Their food consists mainly of the foliage of the trees among which they live. See MARSUPIALS W. A. H.

Tree Mallow. See LAVATERA.

Tree-runners, small birds of the genus *Neositta* (peculiar to Australia and New Guinea) and the nuthatch family (Sittidae), which is found throughout North America, Europe, and Asia. Tree-runners are arboreal birds with short tails, long, pointed wings, and sharp beaks, either straight or slightly curved upwards. They are generally brown above and white below, with a large patch of bright rufous (or white) on the wings that is conspicuous when they fly. Some species have the head brown, others black, and others white. Except when nesting, tree-runners associate in small parties and run over the branches and trunks of trees searching for insects concealed in the crevices of the bark. They almost always begin at the top and travel downwards, clinging head down to the rough bark with great ease. At intervals they utter a series of clear, chattering notes. They construct very remarkable nests in the forks of upright dead boughs. These are composed of strips of bark, stuck together with cobweb and carried downwards along the branch in such a way that the junction of the nest with the tree is obscured, making them very difficult to discover. The small, cup-shaped hollow at the top is lined with pieces of lichen or finer bits of bark, and contains three eggs, white, mottled all over with slate-coloured or greenish spots.

Five species of tree-runner occur in Australia, but none extends to Tasmania. The best-known are the Orange-winged Tree-runner (*N. chrysoptera*) of the eastern States, the Black-capped Tree-runner (*N. pileata*) of southern and western Australia, and the White-headed Tree-runner (*N. leucocephala*) of New South Wales and southern Queensland. The two others occur in the north of the continent. W.B.A.

Black-capped Tree-runner (*length* 4½ *in.*).

Tree-tits. See FLY-EATERS AND TREE-TITS.

Trema, a widespread tropical genus of the family Ulmaceae; the only species indigenous to Australia is *T. cannabina*, the Peach-leaved Poison-bush or Rough Fig. This is a small tree or shrub, with peach-like leaves rough to the touch, polygamous flowers, and small succulent fruits with a bony seed. It is reputed to be poisonous; research shows that it is very fibrous, and consequently indigestible, which may

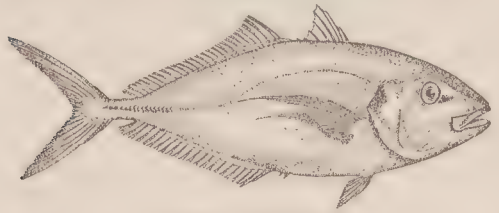
account for its reputation. Abundant on the borders of scrubs, it has been suggested as a source of supply of charcoal.

Trenwith, WILLIAM ARTHUR (1847-1925), born at Launceston in Tasmania in 1847, worked with his father at bootmaking from 1856 to 1866, and in 1867 set up for himself in Melbourne. There he organized a 'National Reform League' in the interests of the inchoate Labour movement, and in 1880 founded the bootmakers' union; his influence extended to Adelaide, where in 1886 he played the chief part in settling a bootmakers' strike and establishing a board of conciliation. In 1887 he was made president of the Melbourne trades-hall council, and was appointed a commissioner of the Adelaide exhibition of that year and the Melbourne exhibition of 1888 (see EXHIBITIONS). He made two attempts to enter parliament—in 1879 and 1886—and in 1889 was elected to the Victorian assembly for Richmond, which seat he held until 1903. In the assembly he was a marked Labour man, actively assisting the shipping strike of 1890; he also advocated federation, and was one of the ten Victorian representatives in the convention of 1897-8. In 1900 he left the Labour party and joined Sir George Turner's ministry as minister for works and railways, retaining these portfolios in the Peacock ministry of 1901-2. In 1903 he was elected one of the senators for Victoria in the Commonwealth parliament, but lost his seat at the elections of 1910. He died in July 1925.

Trepang. See ECHINODERMATA.

Trevalla. Two valuable food-fishes, resembling but not related to the Carangidae, are in the southern States also known as trevally or trevalla. The Snotgall Trevalla (*Seriolella brama*), the warehou of New Zealand, is inappropriately called sea bream in South Australia. The other species is the Spotted or Mackerel Trevalla (*S. punctata*). Both are esteemed as table-fish, and are restricted to southern waters.

Trevally. A large number of important food-fishes are included in the family Carangidae, of which many genera and species are distributed throughout temperate and tropical seas. Various members of the typical genus *Caranx*, which may be conveniently grouped under the vernacular name trevally, occur in Australian waters, the larger number being restricted to the tropics. Some attain a large size, and all are excellent eating, though their flesh is apt to deteriorate rapidly. The trevally



Caranx georgianus.

of the Sydney markets, *Caranx georgianus*, occurs on all coasts of the southern half of Australia, and extends to New Zealand and Lord Howe Island. It attains a length of 30 inches, and congregates in huge schools during the breeding-season. The same species is known as silver trevally, white trevally, and skipjack in other States, and in Victoria and South Australia is sometimes very inaptly called silver bream.

The King Trevally (*C. speciosus*) and the Great Trevally (*C. forsteri*) are tropical species attaining a length of three or four feet; a number of smaller forms occur on the northern seaboard of the continent. See PENNANT-FISHES.

A.R.McC.

Trichoptera. See CADDIS-FLIES.

Trigger-fishes, members of the family Balistidae, inhabitants of tropical seas, only occasionally ranging south of the Queensland border. They are encased in a jointed armour of stout plates that leave only the fins exposed; a strong spine on the back can be erected at will, and locked in an upright position by several smaller spines behind it. This peculiar structure apparently safeguards the fish from larger enemies, which find the long, fixed spine a serious danger in their mouths; moreover, the rows of thorns on each side of the tail, and the stout armament, cannot be bitten through without difficulty. Some trigger-fish are strangely and gaudily decorated with bright colours arranged in fantastic patterns; these are doubtless recognition-markings, enabling the many species to find one another among the wealth of tropical life. A number are known to be poisonous.

Allied fishes of the family Triacanthidae differ in having no hard plates covering the skin; but each ventral fin is represented by a long and strong spine like that on the back, and all three can be locked in position in such a way that anything attacking the fish finds it exceedingly awkward to swallow. They are usually of a beautiful silver colour, and inhabit the tropics, never venturing south of Queensland waters.

A.R.McC.

Trigger-plants, the vernacular name of a genus, endemic in Australia, which is known to nurserymen as *Stylidium*; its correct name is *Candollea* (see CANDOLLEACEAE). The popular name refers to the irritable style characteristic of the genus.

Trigonella, a genus of the family Leguminosae, widely spread outside the tropics, con-

T. suavissima.

sisting of herbs with leaves divided into three leaflets. The flowers are yellow, in clusters; pod curved, ½-¾ inch long. *T. suavissima*, an inland species, is the Australian Shamrock of Sir T. L. Mitchell, who speaks highly of it as a delicious vegetable, preserving its green colour when boiled. It is also known as Menindie clover, owing to its abundance in that locality; the natives on the Darling River call it 'calombo.' It is a fragrant perennial herb, much valued as a fodder-plant, and regarded as an excellent antiscorbutic.

Tristania, a genus of the family Myrtaceae, consisting of tall shrubs or trees with white or yellow flowers, and extending into New Caledonia and Malaysia. The calyx-tube is bell-shaped, with 5 short lobes; petals 5, broad and imbricate; stamens numerous, united in bundles opposite the petals; capsule opening in 3 valves; seeds often expanded at the end into a flat wing. *T. conferta* (Brush Box), which nurserymen insist on calling *Lophostemon*, has rich glossy leaves and feathery flowers with fruits like those of *Eucalyptus*. It is one of our best shade trees, and is largely used for street tree-planting. The timber is much in demand for shipbuilding; ribs of vessels made from its wood are known to have remained unimpaired for more than 30 years. It is resistant to white ants, and is used in the construction of wharves and bridges; the tram-rails upon which logs are hauled from the forests are also frequently made of it, as it is not cut by the iron wheels, but is polished by traction. It is somewhat difficult to season, owing to a tendency to warp or twist when drying. *T. laurina* and *T. neriifolia*, both known as water gums, are ornamental shrubs with bright yellow flowers.

Trocas Shell. See MOLLUSCA.

Trochocarpa, a genus of the family Epacridaceae, consisting of shrubs and trees, endemic in Australia. The corolla-tube is cylindrical to bell-shaped; fruit a globular drupe, the outer coat pulpy, the stone separating into 10 distinct sections (pyrenes). *T. laurina* (known as Beech, Brush Cherry, and Brush Myrtle; the 'barranduna' of the aborigines) is a small tree, whose shoots when young are bright red and attract attention at a great distance. It has a hard, close-grained, tough timber of a uniformly warm brown colour, and is useful for turnery if carefully seasoned.

T. laurina.

Tropical Medicine. Tropical diseases have always taken a tremendous toll of the lives of Europeans, and have been studied from the earliest times; but the foundation of modern tropical medicine was laid by the realization that every infectious disease is caused by the presence of parasites which live and multiply in the body of the host. Following on this came Manson's discovery in 1879 of the life-history of *Filaria bancrofti* in the mosquito (see BANCROFT, JOSEPH) and Laveran's discovery of the parasite of malaria in 1880. These led the way to Ross's demonstration in 1897 of the development of the malaria parasite in the anopheline group of mosquito.

Although malaria is a disease of widespread distribution, it is most prevalent in tropical countries and probably causes more sickness and economic loss than any other disease. Ross's discovery, and the subsequent proof, that man can be infected with malaria only from the bites of infected anopheline mosquitoes, which, further, must have been infected from a human being suffering from the disease, indicated at least one of the means which must be adopted for the eradication of malaria—the prevention of the breeding of such mosquitoes. Already brilliant results have been obtained by working along these lines, and regions where malaria previously raged have been practically cleared of the disease.

The demonstration in 1900, by Reed, Carroll, Agramonte, and Lazear of the transmission of yellow fever by a mosquito—*Stegomyia fasciata* (or *Aedes aegypti*)—has led to the eradication of this disease in many localities, and made possible such undertakings as the building of the Panama Canal in a region where the malady had previously levied a heavy toll on human life.

The study of the rôle of insects in tropical medicine is thus important, since many diseases occurring in tropical countries are caused by parasites which may be carried more or less passively, or which may undergo an essential part of their life-history in the bodies of such insects and are transmitted to man by the bites of infected vectors. Besides malaria and yellow fever other diseases thus conveyed to man by mosquitoes are filariasis and dengue fever; the tsetse fly transmits sleeping sickness (due to a trypanosome); and plague is largely spread by fleas which have become infected with the bacillus from plague-stricken rats.

It is noteworthy that many of the diseases of tropical countries are caused by protozoa—unicellular organisms belonging to the lowest group of the animal kingdom. In many protozoal diseases the parasite has a complex life-history, undergoing a definite cycle of changes, part of which must be spent in the body of an animal of one group, such as man, and part in the body of another animal, the intermediary host, usually an insect. Malaria, sleeping sickness, the various forms of relapsing fever, and amoebic dysentery are examples of protozoal diseases.

The strict localization of certain of these to tropical regions and the greater prevalence of

others find their explanation in the distribution and abundance of the insects acting as intermediary hosts. Thus sleeping sickness is strictly confined to those parts of Africa where certain kinds of tsetse flies are found. Yellow fever, again, requires for its spread a particular species of mosquito, and though this disease is at present confined to parts of America and Africa there is a possibility of its spread to other countries where this mosquito breeds in abundance. In northern Australia and in most Eastern countries *Stegomyia fasciata* is an extremely common mosquito; but there is as yet no yellow fever, since the mosquitoes have not become infected.

Cholera, plague, some forms of dysentery, leprosy, and other diseases are caused by bacteria, minute germs belonging to the vegetable kingdom. The density of the native population and unhygienic modes of life are great factors in the prevalence and spread of diseases in warmer countries.

Another group of diseases is caused by parasitic worms or helminths. Most of these find their home in the intestinal tract of man or animals, and their eggs are passed with the faeces. The primitive sanitary arrangements of the native greatly facilitate the spread of these parasites. An important member of this group is anchylostomiasis, or hookworm disease, so prevalent in tropical countries. *Filaria* is also a parasitic worm, but the species of special interest to man in tropical and subtropical Australia inhabits the blood as a young larva (microfilaria) and the lymph-glands as an adult, producing a variety of conditions such as elephantiasis. The adult form of this worm was discovered in 1876 by Joseph Bancroft of Brisbane; hence the name *Filaria bancrofti* given to it by its describer Cobbold. (See NEMATHELMINTHES.)

The moist heat of the tropics is very favourable to the development of parasitic fungi; hence skin-diseases, due to the growth of these organisms in the skin, occur in great variety. The effects of tropical climate itself on the well-being of Europeans is not yet clear. Many conditions which in the past have been considered as manifestations of these effects have been shown to be parasitic in nature.

The conditions in tropical Australia are exceptional. The country is sparsely populated; there are comparatively few natives, scattered over vast areas: the distances between settlements are great, and the opportunities for the spread of disease are correspondingly lessened. Of tropical diseases occurring in northern Australia malaria and (possibly) anchylostomiasis are the most important; dengue fever occurs epidemically from time to time, sprue is a disease characterized by diarrhoea and sore tongue, and filariasis with all its manifestations, yaws, granuloma pudendi, beriberi, and climatic bubo require attention. The value of preventive measures cannot be over-estimated. The malaria-transmitting mosquitoes breed in swamps and shallow collections of water; the draining of these may be expensive, but the results obtained —reduced sickness and increased economic efficiency—would in general be commensurate with the cost.

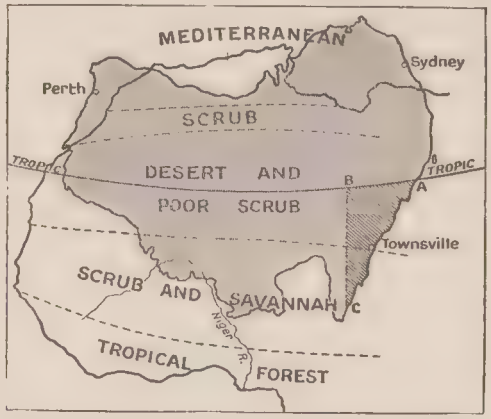
The yellow-fever mosquito, which is extremely common in all towns north of Newcastle, is a house mosquito, breeding in any small collections of water in and about houses, such as water tanks, old tins, etc., and its eradication would be simple with the co-operation of town authorities and the people. Improved sanitary conditions will keep in check the bacterial diseases and anchylostomiasis.

In 1910 as the outcome of proposals by Sir T. Anderson Stuart and Dr. Frodsham, then bishop of North Queensland, the Australian Institute of Tropical Medicine was founded. The Commonwealth government, realizing the importance of the work, increased its grant in 1912 and enabled a large, fully-equipped building to be erected, and the staff to be increased. Besides studying the diseases prevalent in northern Australia and Papua, the staff is investigating the effect of the tropical climate on the white race, and endeavouring to determine whether a white race can live permanently in the tropics. Australia offers unique opportunities for this research, and already many important facts have been collected.

H.P.

Tropical Settlement. Nearly 40 per cent of the Commonwealth lies within the tropics, so that the problem of tropical settlement is one of paramount importance, especially as the bulk of the population has come originally from the British Isles, with which only the Tasmanian area has much similarity of environment. The regions where settlement has been most successful (e.g. round Sydney, Melbourne, Adelaide, and Perth) exhibit the characteristics of the warmer Mediterranean lands of Europe, and there is nothing like the Australian tropics in the whole of Europe or North America. The problem is most clearly apprehended by making a careful study of other parts of the world and noting what regions offer the best analogies for controls.

It is first necessary to distinguish between two well-marked Australian regions, both within the



Homologous conditions in Africa and Australia (ABC=eastern uniform-rain region).

tropics. The boundary between them runs almost north and south through Queensland, joining Cooktown to Longreach (ABC in figure). The eastern region contains only about 140,000 square miles, the western a million. Rainfall in the eastern region is fairly uniform throughout the year; the northern and western region has from four to ten months without noteworthy rainfall—in other words, it is a region of permanent winter drought. This factor, coupled with the high temperatures (which are only exceeded in the Sahara) and high evaporation, has resulted in an environment of grass-lands,

scrubs and desert. The only notable areas of tropical forest in Australia occur in the eastern (uniform-rain) region. To the west the air is during most of the year too dry to permit anything but a xerophytic type of vegetation; there are areas of eucalypt woods, and thickets of mulga and other acacias, but these are interspersed with grass-lands, and constitute 'savanna-woods' or scrub rather than forests.

The environment of the eastern tropical region closely resembles that of the peninsular portion of India. Calcutta and Townsville have very similar climates. The following table gives the foreign homoclimes of tropical Australian towns:—

TROPICAL AUSTRALIAN HOMOCLIMES.

Australian Locality.						
Locality.	Temperature.			Rainfall.		
	Average.	Hottest Month.	Coldest Month.	Average.	Wettest Month.	Driest Month.
	° F.	° F.	° F.	in.	in.	in.
Broome	79·8	85·9	70·3	23	6	0
Nullagine	79·8	85·9	70·3	23	3	0
Carnarvon	71·0	80·0	60·0	9	3	0
Wiluna	70·0	85·0	52·0	10	2	0
Darwin	83·0	84·0	77·0	62	15	0
Daly Waters	80·0	87·0	69·0	27	6	0
Alice Springs	70·0	84·0	53·0	11	2	0
Townsville	78·0	82·0	66·0	49	11	0
Wyndham	84·5	88·3	76·2	27	8	0
Foreign Homoclime.						
	° F.	° F.	° F.	in.	in.	in.
Banana, River Congo	77·9	81·5	72·5	29	6	0
Colima, SW. Mexico	76·1	80·0	69·6	34	7	0
Olukonda, SW. Africa	72·0	77·0	51·0	19	5	0
Windhoek, SW. Africa	67·0	74·0	56·0	15	4	0
Cuttack, Eastern India	80·0	87·0	70·0	55	12	0
Quixeramobim, Brazil	81·0	83·0	79·0	27	6	0
Biskra, Algeria	69·0	89·0	51·0	10	1	0
Calcutta	78·0	82·0	65·0	60	12	0
Tinnevelly	84·3	89·5	78·5	28	9	0

The more arid inland tropical regions of Australia do not correspond closely with inland India, which is more elevated and much wetter. The homoclime for those regions is found in north-western Africa. Northern Nigeria is analogous to the north of the Territory; central Australia is akin to the Sahara in origin and position (though luckily not in area). No other area resembles tropical Australia so closely—for no other land in the same latitudes is so broad, so low, and as a whole so remote from the sea; but no district in Australia is so 'muggy' and uniformly unattractive as Sierra Leone or the Guinea Coast, because its continent barely reaches within 12 degrees of the equator.

This tropical Australia (1,149,320 square miles) contains about 190,000 people. Some 3500 live in Western Australia (364,000 square miles), half of them in Broome; about 3000 live in the Northern Territory (426,320 square miles), more than half of them in Darwin. The remaining 183,500 live in northern Queensland, most of them (153,500) in the small uniform-rain region, where there are four large towns—Rockhampton (26,000), Townsville (21,000), Charters Towers (9000), and Cairns (7000)—and many smaller towns, e.g. Atherton, Cardwell, Bowen, and Mackay. This population of 190,000 (out of 6 millions) is too small to indicate very clearly the possibilities of tropical settlement. The census maps show that there has been practically no spreading in the last 25 years. On the population maps the line showing 'one person to 4 square miles' has since 1901 retreated towards the coast in the eastern region. In the Northern Territory the population, 4898 in 1891, decreased to 3656 by 1925, though the Commonwealth spent hundreds of thousands of pounds to encourage closer settlement. The reason too often unthinkingly given for this lack of population is connected with health; the tropics, it is said, are unhealthy for the white race. But the data are not sufficient to support this assertion; indeed, as regards pastoral occupation by white men in the full vigour of life, it seems probable that the whole available pastoral region is quite healthy—cattle and sheep, however, are grazed, not on the low coast-lands, but on uplands usually 50 miles or more from the sea, and 500 feet or so above sea-level. Again, there is no doubt that most tropical diseases have not gained a hold on northern Australia; malaria, dengue, and hook-worm certainly exist there, but are retreating before medical science. The aboriginal population is small, and is invariably segregated if near whites, so that this factor in spreading disease is almost negligible. In fact, exhaustive tests as carried out by Drs. Breinl, Young, and Priestley at Townsville, show that the only definite physical ill resulting from living in that moderately tropical environment (in 19° S. lat., 1300 miles from the equator) is a widespread liability to tropical neurasthenia; Priestley also states that concentrated and continuous mental work is not possible in low latitudes on the coast.

Discomfort therefore, rather than disease, is one great factor in the lack of progress in the north, and this may be measured approximately by the wet-bulb thermometer. In Brisbane, well outside the tropics, the average wet-bulb reading for two months of the year is over 70°. In Rockhampton that average prevails for six months, in Townsville, Broome, and Wyndham for seven, in Cooktown for eight, in Darwin for nine, and on Thursday Island for the whole year. Under such conditions the life of the women is in many places extraordinarily hard; they are confined to the house, can get no domestic help, and live under iron roofs which are eminently unsuited to the climate. Further, except for the Atherton tableland (2500 feet high) behind Cairns, there are no highlands close to the coast, on which a complete change of climate might be obtained.

Health statistics are at a first glance satisfactory, the birth-rate being high and the infantile mortality low. The tropical population, however, is not typical of Australia as a whole; there is an unusually large proportion of men to women (as much as 167 to 100 in the north-west), and a much higher proportion of young married women among the females. In these circumstances the birth- and death-rates are not really comparable with those of temperate Australia. The opinion of the writer—gathered from travels in much of tropical Australia—is that the less robust women inevitably migrate south to temperate regions. This tendency towards a 'selected' population is not easy to prove, but, if it exists, must obviously produce good health records, not because the climate is suitable, but because the weaklings leave the country.

The economic factor that hampers tropical set-

tlement can be expressed in a sentence:—'No one will face the discomforts of the tropics as long as he can gain an equal subsistence in temperate lands.' The distribution of population in the Australian tropics, meagre as it is, is the result of experiments made over about 100 years. Regions lavishly endowed by nature are being settled to a considerable extent in spite of discomforts; such are the north-eastern coastlands with their heavy rainfalls, amounting to 165 inches a year near Cairns. Here in the damp, hot air luxuriant forests grew, and have been replaced by sugar-cane, cotton, sisal hemp, and tropical fruits. The rest of the tropical area is somewhat arid, even where it receives 40 inches of rain in the summer. In other parts of the world, such an environment—hot and dry for three-quarters of the year—is considered primarily suitable for pastoral occupation, not for close settlement. While temperate Australia is relatively empty, a population is not likely to settle in the isolated and unattractive north. In the broad belt of fair pastoral country, occupying the hinterland between the humid coasts and the desert interior, a denser pastoral occupation will probably develop. Mining may bring settlers for a time, but metal-mining never led to permanent settlement in regions otherwise unattractive.

See Rivers's *History of Melanesian Society* (1914); Dixon's *Racial History of Man* (1923); Huntington's *West of the Pacific* and Gregory's *Menace of Colour* (both 1925); and Taylor's *Environment and Race* (1926).

Gr.T.

Tropic-birds, also known to sailors as boatswain-birds—a name originally applied to the skuas—because their shrill call is thought to resemble a boatswain's pipe, are rare in Australian seas. Two species sometimes occur on the tropical coasts; one of these—the Red-tailed Tropic-bird (*Phaethon rubricauda*)—breeds on Raine Island and on the coasts of northern Queensland and has also been known to breed on the Houtman Abrolhos groups off Western Australia.

W.B.A.

Trott, George Henry Stephen (1866-1917), known among cricketers in Australia and England as 'Harry' Trott, was born in Victoria on 5 August 1866. His prowess in club and intercolonial matches won for him a place in teams opposed to the English elevens visiting Australia, and in 1888 he attained a place in the Australian eleven which was the eighth to visit England. An all-round player of great skill, a right-hand slow bowler with a good leg-break, an excellent field at point, and a sound and courageous batsman, he played many fine innings; one memorable performance was in the second innings of Australia in a test match at Lords in June 1896. Australia in the first innings made a meagre 53. Trott rose to the occasion in his second innings, making 143 while S. E. Gregory scored 103, and so retrieved the disastrous start. Of his capacity for the onerous position of captain a competent English critic in 1896 wrote 'Trott made an ideal Captain, and, with the exception of Murdoch, proved himself incomparably the best Captain the Australians have ever had in this Country. . . . Blest with a temper that nothing could ruffle he was always master both of himself and his team whatever the position of the game. More than that, his judgment in changing the bowling was rarely or never at fault.' He died at Melbourne on 12 November 1917.

C.R.W.

Trout. Although there is no indigenous trout in Australian waters, a number of European and American species have been introduced with more or less success. The Rainbow Trout (*Salmo irideus*) thrives in upland streams, and affords good sport for rod-fishermen. The Brown Trout (*S. fario*) is successfully acclimatized in Tasmania, where it grows to a large size, and also occurs less plentifully in Victoria and New South Wales. Some native fishes, such as the jollytails (*Galaxias*) and salmon trout (*Arripis*), are commonly regarded by fishermen as trout, though they have little resemblance to, and no affinities with, the family Salmonidae to which the true trout belongs.

Only two species of true Salmonidae have been after many attempts successfully acclimatized in Australia. In 1841 a band of enthusiasts in Tasmania applied to friends in England for a shipment of salmon ova. In 1845 50,000 were despatched, and other batches in 1860 and 1862, but all perished on the voyage. A consignment, however, sent out in 1864, consisting of 100,000 salmon ova and one box of trout ova thrown aboard at the last moment, was landed successfully, and on 4 May of that year the first brown trout (*S. fario*) made its appearance, the first salmon (*S. salar*) being hatched on the 5th. The trout flourished exceedingly, and even developed (in the Great Lake) into the *ferox* variety, then thought to be a separate species; the salmon, however, persistently disappeared, being probably destroyed by local enemies during migration. Since that time other species have been introduced, notably the Rainbow Trout of California (*S. irideus*) and the Salmon Trout (*S. trutta*), and experiments are being made with the North American non-migratory Salmon (*S. salar sebago*). The trout acclimatized in New South Wales streams are mostly *irideus*; *fario* has also been introduced, and does well in the warmer foothill rivers. Other salmonoids have not thriven in New South Wales at all, or, indeed, in Australia.

A.R.McC.

Trucanini (1803?-1876), also called Truganini, Trucannini, Truganinni, Truganina, and Lalla Rookh, is usually spoken of as the last full-blooded Tasmanian aboriginal. The title has been claimed for Fanny Smith of Port Cygnet in Tasmania, who seems to have been a half-caste, and for a Mrs. Seymour, who died in 1909 at Hog Bay on Kangaroo Island, South Australia. Trucanini, who belonged to the Bruni Island tribe, is said to have been born in 1803, the year that saw the beginnings of white settlement in Tasmania. When she was a girl two sawyers from Birch's Bay persuaded her and two aboriginal men to come for a trip across to Bruni; on the way the sawyers murdered the two native men. Trucanini's sister Moorina was carried away to Bass Strait by a sealer called Abyssinia Jack. Possibly he was the 'Abyssinia' who is mentioned as the leading man on Kangaroo Island in 1813. Trucanini next appears as assisting G. A. Robinson (q.v.) in gathering in the aborigines, a work in which she showed courage, endurance, and devotion in the highest degree. She accompanied Robinson and McKay in some of their longest and most dangerous journeys in the bush, including Robinson's remarkable expeditions along the southern and western coasts of the island; and it was she whose intercession saved Robinson's life when he met a mob of hostile aborigines near the Arthur River. She went to Flinders Island with her fellow-aboriginals, but Robinson

is said to have taken her and some others to Victoria when he was appointed protector there. This, however, and other stories about her adventures in Victoria lack confirmation. Robinson was certainly anxious to take all the Tasmanian aborigines to Victoria, but nothing came of it; and when, in 1856, the 16 survivors were removed from Flinders Island to Oyster Cove Trucanini was one of them. By 1873 all the others were dead, and Trucanini was taken to Hobart where she died on 8 May 1876. Her skeleton is in the museum at Hobart. During her last few years her short stout figure and red turban were well known in Hobart streets.

The last of Trucanini's five husbands was William Lanne or Lanney, also called King Billy (1835?-1869), the last male Tasmanian aboriginal. He was the youngest child in the last family of aborigines to remain at large on the mainland of Tasmania. In 1842, seven years after all the others had been removed, this family of six was brought in from Cape Grim in the far north-west by a sealer. Lanney too was removed to Oyster Cove in 1856, and attended a government-house ball in 1864. He was a quick, active young fellow, and became a whaler; in February 1869 he was paid off from the whaler *Runnymede*, went 'on the spree,' fell ill, was taken to the Hobart hospital in a very low state, and died there on 3 March 1869. His head was cut off by one of the surgeons, who was interested in anthropometry. See TASMANIA, ABORIGINES OF. T.D.

Trumble, HUGH, born in Melbourne on 12 May 1867, first took part in first-class cricket in 1887, when he played for Victoria against New South Wales. By 1904, when he played in his last inter-State match, he had taken 129 N.S.W. wickets for an average of 22.1 runs—no other Victorian bowler has taken 100. He entered test cricket in 1890 as a member of Murdoch's team, but achieved little, because Turner and Ferris—the most deadly Australian combination yet known—did most of the work. With Blackham's 1893 team he did better, though Giffen and Turner were the principal bowlers, and in Trott's team of 1896 he took his place as the mainstay of the Australian attack; in 1899 he repeated this performance, and in 1902 attained his best form, taking 26 wickets for an average of 14.26. Outside test matches he was always prominent; in 1893 he took 123 wickets at 16.39, in 1896 148 at 15.1, in 1899 142 at 18.43, and in 1902 149 at 14.27 (these figures include tests). He also played for Australia against the visiting English teams of 1894-5 (Stoddart's), 1897-8 (also Stoddart's), 1901-2 (Maclaren's), and 1903-4 (Warner's). He has thus taken part in 31 test matches, taking 141 wickets at 20.88—the greatest number credited to any bowler on either side. His batting was also very useful, and at its best when runs were most needed (in test matches he scored 838 runs, with an average of 19.95), and as he fielded well in the slips he may be reckoned one of Australia's most successful all-round players. In first-class cricket his record is 5952 runs with an average of just over 20, and 1001 wickets at 18.

Over 6 feet in height, he was a right-hand bowler of medium pace, with a perfect length, a good break from the off, great variety, and subtle judgment. See CRICKET. J.C.D.

Trumper, VICTOR THOMAS (1877-1915), born in Sydney on 2 November 1877, was the most glittering in style, the most versatile in strokes, and the most fascinating, of batsmen, match in and out, ever produced in Australia. The only batsman comparable with him in magician-like use of the bat was Prince Ranjitsinhji, and on Australian form Trumper was the better of the two. Born a cricketer—he batted with the grace and finish of a master stylist while still a boy in knickers at the state school in Crown-street, Sydney—he was accustomed to practise at the nets of the Carlton club on the Sydney cricket-ground after school hours. He visited England with the teams of 1899, 1902, 1905, and 1909, and established himself in the hearts of the sporting world there as firmly as he had done in Australia. In 1902 in a wet season he towered over every other batsman, English or Australian, scoring 11 centuries and 2570 runs with an average of 48.49. But averages do not disclose his true greatness; he was a match-winner, for whom averages had no appeal. A more perfect type of team-cricketer has never been seen. No position or wicket or bowling was too difficult for him to master, and in mastering it he had in mind the making of things easier for the man at the other end, the winning of the match. He hit with skill and daring rarely seen, at the same time exercising an uncanny judgment and knowledge of the bowler's wiles and powers. Ill-health unfortunately cut short his career, and he died at Sydney on 28 June 1915 while he still should have been almost at his zenith.

In club cricket in Sydney, playing for Paddington in 1897-8 he made a century in every innings save two, and in those he was run out after making over 80; the scores were 82, 193, 125, 85, 120, 191, 133, 162, three of the last four innings being 'not out' and the average 204.2. His highest innings in England was 300 not out against Sussex, and in Australia 335 for Paddington against Redfern in 2¾ hours. His highest scores in representative cricket were 300 against Sussex, 292 against Tasmania, 253 against New Zealand, 230 against Victoria, 213 and 201 against South Africa, and 208 against Queensland, besides ten others of 200 or more in first-class cricket. In test matches against England Trumper scored 2263 runs at an average of 32.79 and against South Africa 900 runs at 75 per innings. In all matches for New South Wales he made 5701 runs at 47 per innings. In 1913 he was given a testimonial match (New South Wales *v.* Rest of Australia), which with subscriptions from the public brought in close upon £3000; this was invested and placed under trustees for his use. J.C.D.

Trumpet-bird. See RIFLE-BIRDS AND TRUMPET-BIRD.

Trumpeter, the vernacular name of several important food-fishes of which the most valuable is the Tasmanian or Real Trumpeter (*Latris lineata*) of the family Latrididae. This species, which occurs also in the waters of Victoria and possibly of southern New South Wales, grows to a length of about four feet and a weight of about 60 lb., and is one of the choicest and commonest food-fishes in the Tasmanian market—where it is often called 'stripey' on account of the longitudinal bars on the sides of the body. The adult fish frequent the deeper water off-shore, where they are captured with hook and line; the young are common in bays and estuaries. The Bastard Trumpeter (*Latridopsis forsteri*)—of the same family as the

preceding but with a wider range, extending from Tasmania to Victoria, New South Wales, South Australia, and New Zealand—is also a valuable market-fish in Tasmania. It grows to a length of two feet, and although of good edible quality is not generally considered as choice as the real trumpeter. It frequents similar localities, but at spawning-time the adults migrate to shallower water and may be captured by net-fishermen. Hand-lines are not used, for this fish rarely takes a bait. The Trumpeter or Trumpeter Perch (*Pelates sexlineatus*), belonging to the family Serranidae, is found right round the Australian coast-line and extends to India and China. Although by no means uncommon, and a good food-fish, it is too small to be seen often in the markets, rarely attaining a length greater than nine inches. The term 'trumpeter' originated from the peculiar grunting noise which it emits at intervals after removal from the water. For the Queensland trumpeter see JAVELIN-FISH, and for the trumpeter whiting see WHITINGS. T.C.R.

Tryon, SIR GEORGE (1832-1893), born at Bulwick Park in Northamptonshire on 4 January 1832 and educated at Eton, in 1848 joined the navy as a cadet (midshipman, 1850; lieutenant, 1854; commander, 1860; captain, 1866; rear-admiral, 1884; vice-admiral, 1889), and served in the Black Sea during the Crimean war both at sea and with the naval brigade in the winter of 1854-5. In November 1858 he was appointed to the Queen's yacht, and in 1861 to the *Warrior*, the first British sea-going ironclad. During the Abyssinian expedition of 1867-8 he was director of transport, and in 1871 was made private secretary to G. J. Goschen, then first lord of the admiralty. After another term of sea-service, spent chiefly in the Mediterranean, he became secretary of the admiralty in 1882-4 and took the opportunity to organize a department of naval intelligence.

In 1884 the problem of colonial naval defence occupied the admiralty's attention (see NAVAL DEFENCE), and Tryon was sent to command on the Australian station—the first admiral in charge of it—in order that he might, after consultation with the colonial authorities, devise a scheme in which they could co-operate. From this mission resulted the agreement of 1887; but far more important was the lasting impression produced by his advocacy of personal service:—

> It is not a mere subsidized force that will do what is wanted. It is not only money that is required to produce effective forces, but it is the personal service of our countrymen all over the world. (Letter to Samuel Griffith, October 1886.)

From that phrase sprang the Australian navy.

Nor was this the only service that Tryon rendered to Australia. He pushed on energetically the equipment of Garden Island in Port Jackson, which his predecessor Commodore Erskine had obtained from New South Wales as a naval depot; he aided the local authorities in siting batteries and mine-fields for the defence of the principal ports; he proposed a mutual insurance scheme under which war-losses caused by an attack on any undefended Australian town should be recouped out of a fund contributed to by each of the colonies in proportion to its population; and—largely under the influence of Samuel Griffith—he made useful reports on the kanaka labour trade and the problem of New Guinea.

His belittling of the 'mere subsidized force' did him no good with the admiralty. While he was still busy with intercolonial negotiations concerning his scheme, it was taken out of his hands to be dealt with by a colonial conference in London under the eye of the Imperial authorities; his disappointment made him ask to be relieved of command at the end of two years. On return to England he made an unsuccessful attempt to enter parliament, and after nine months on half-pay was made superintendent of reserves, an appointment which involved command of a fleet at the yearly manoeuvres of 1888-90; in 1891 he took command on the Mediterranean station, and devoted much attention to fleet manoeuvres on a grand scale. While engaged in one of these on 22 June 1893 off Beyrout in Syria, he gave a wrong order which resulted in the sinking of his ship, the *Victoria*, by the *Camperdown*. He went down with his ship. (C.B., 1868; K.C.B., 1887.)

See Penrose Fitzgerald's *Life of Vice-Admiral Sir George Tryon.*

Tucker, THOMAS GEORGE, born at Burnham in Buckinghamshire on 29 March 1859, and educated at the Northampton Grammar School, the Royal Grammar School at Lancaster, and St. John's College, Cambridge (Craven scholarship, 1881; B.A. and senior classic, 1882; M.A., 1885; Litt.D., 1890; hon. Litt.D. Dublin, 1892), in search of health made a voyage to Melbourne, and on his return to Cambridge was elected a fellow of St. John's. In 1882 on the nomination of Jowett and Sidgwick he was appointed professor of classics and English in University College, Auckland (New Zealand); in 1885 he was appointed without opposition to the chair of classical philology in Melbourne and held it until 1920, when he was made emeritus professor. In 1892 he was made an honorary doctor of letters of Dublin in recognition of Greek scholarship. For several years he was dean of the faculty of arts and has been president of the professorial board. He was also for some years a trustee of the public library and gallery of Victoria. Tucker's appointment to Melbourne thus followed quickly upon the great loss which Sydney had sustained by the death of Charles Badham (q.v.). Australian education owes much to these two. In the class-room Tucker was an able and inspiring teacher, and through his public lectures and writings soon exerted in Australia a great influence on the study of literature. His point of view is succinctly stated in one of his prefaces 'I hold that literature has a substantial value only when it contains matter of unforced and universally comprehensible human interest—serious, humorous, imaginative, or realistic—and that the only style which has in it the salt of permanence is the style of high simplicity. . . . .'

He has produced universally known editions of the *Supplices*, *Choephoroe*, and *Seven Against Thebes* of Aeschylus, the *Frogs* of Aristophanes, and the eighth book of Thucydides; among his other publications are *An Introduction to the Natural History of Language* (London, 1908), *Life in Ancient Athens* (London, 1907), *Life in the Roman World of Nero and St. Paul* (London, 1910), *Sonnets of Shakespeare's Ghost* (Sydney, 1920), *The Judgment and Appreciation of Literature* (Melbourne, 1925). His most notable work in English is *The Sonnets of Shakespeare with Introduction and Commentary* (Cambridge, 1924). (C.M.G., 1920.) F.T.

Tuckey, JAMES KINGSTON (1776-1816), born at Donoughmore in Ireland in August 1776, and privately educated, in 1793 entered the merchant service and made a voyage to the West Indies. In 1794 he joined the navy (acting lieutenant, 1798; lieutenant, 1800; commander, 1814; captain, 1816), saw service in the East Indies, and took part in the reduction of Trincomalee and Amboina, where he was wounded. From 1795 to 1801 he was in East Indian waters, aboard H.M.Ss. *Suffolk* and *Fox*, but in 1801 was invalided and sent to England with despatches. In 1802 he was appointed first lieutenant of the *Calcutta*, which took Collins's expedition in 1803 to make a settlement at Port Phillip. While there he made a complete survey and chart of the port and an examination of the adjacent coast, and on return to England published in 1805 *The Account of a Voyage to establish a Colony at Port Phillip in Bass's Strait.* A German translation appeared at Weimar the same year. In September 1805, while escorting a convoy from St. Helena to England, the *Calcutta* was captured by the French and Tuckey was a prisoner of war until 1814; during this time he wrote *Maritime Geography and Statistics*, which he published on his return to England. In 1816 he led an official expedition to the Congo, traversed the river as far as the cataracts, and undertook a journey by land to explore the upper river. Utterly worn out, he was compelled to return, reached his ship on 17 September, and on 4 October died of exhaustion. In 1818 his journal of this expedition was published under the title *Narrative of an Expedition to explore the River Zaire, usually called The Congo, in South Africa in 1816.* J.V.C.-B.

Tufnell, EDWARD WYNDHAM (1814-1896), born at Bath in 1814 and educated at Eton and Oxford (B.A., 1837; M.A., 1842; D.D., 1859), in 1837 entered the Anglican ministry (deacon, 1837; priest, 1839), and became curate of Broadhinton in Wiltshire (1840-46), rector of Beachingstoke (1846-57), and rector of St. Peter and St. Paul at Marlborough (1857-9). In 1859 he was consecrated first bishop of Brisbane. During his 15 years' episcopate he visited all the settled parts of his diocese and built many churches and schools in remote but now important towns; he also in May 1868 established the first synod in Brisbane, diocesan affairs having previously been managed by a small council. In 1874 he retired and returned to England, was curate-in-charge of Charing (1877-9), vicar and rural dean of Croydon (1879-82), and canon of Chichester and vicar of Felpham from 1882 till his death on 3 December 1896. In 1875 he sent out £500 to his old diocese for improvements to the bishop's residence. J.V.C.-B.

Tulip-wood. See HARPULLIA, ULMACEAE, and TIMBERS.

Tungsten. Although this metal occurs as a constituent of several minerals, the only ores of tungsten mined in Australia are wolfram, a tungstate of iron and manganese, and scheelite, a tungstate of lime. Wolfram has been mined in commercial quantities at Deepwater and Torrington, and in smaller quantities in various other parts of the New England district of New South Wales; at Wolfram Camp, Mount Carbine, and Bamford in northern Queensland; and at Pine Creek and Hatches Creek in the Northern Territory. Scheelite has been mined in commercial quantities at Hillgrove and Frogmore in New South Wales, and on King's Island off Tasmania.

The crude ore is dressed up to the required shipping grade, but is not metallurgically treated in Australia. Commercially one does not speak of the percentage of tungsten in these ores, but of the equivalent of tungstic oxide (WO_3). Ore dressed for the market should contain 65 per cent of tungstic oxide (or, as it is often called, tungstic acid) or over. If for the steel trade, the sulphur content should be under 0.06 per cent and the phosphorus under 0.1 per cent. For the chemical trade these impurities do not matter so much. There should not be more than 0.5 per cent of tin or bismuth present in the concentrates.

At small, rich, isolated mines the ore can be hand-picked, broken up with a bucking hammer, and hand-jigged. Where there is sufficient ore to warrant the erection of machinery, it is machine-crushed. In some places they use heavy stamps, the screen having eight holes to the linear inch; at other places the ore is reduced in stages by ore-breakers, rolls, and Huntington or Krupp mills having screens with 12 holes per linear inch. The sands are then treated on some form of table—e.g. Wilfley, Card, Woodbury, Krupp, Ferraris, Frue vanner, stationary concave-buddle, blanket table, launder, or fine jig. If the concentrates contain bismuth, they are dried and passed over shaking screens, so as to grade them into 25, 12, and 8 mesh, prior to treatment by magnetic separators. Each size has to be treated by itself. At the Sydney Export Company's works the concentrates were first treated by a four-pole Ulrich machine. The product from the first pole contained the more easily magnetized wolfram, together with any iron due to wear and tear of the crushing machinery; in order to separate the iron from the wolfram, the product was re-treated with a weaker current. Certain local improvements have been made on the original machine; for instance, instead of an automatic shovel-feeder, which gave an irregular feed, a horizontally-grooved cylindrical feeder has been installed, and the method of regulating the distance between magnets and belts has been made easier. The residue contains the bismuth, but, being too rich in wolfram, is passed over a two-pole Wetherill magnetic separator, which reduces the amount of tungstic oxide to 0.5 per cent. F.D.P.

Tunny, a large fish (*Thunnus maccoyi*) reaching a length of seven feet, which periodically appears in great schools on the southern Australian coasts, and ranges north as far as Moreton Bay. It is essentially an oceanic species, moving through the water with great speed, and only occasionally entering coastal inlets in search of the smaller school-fish (such as mackerel) which form its prey. Tunnies are torpedo-shaped, their fins fitting compactly into sheaths and hollows so as to offer as little resistance as possible to their passage through the water. The tail is deeply forked and forms a powerful driving-organ; the hinder portion of its peduncle bears a series of finlets both above and below to add power to its movements. The flesh is very red in colour, and oily, but good food. Tunny are commonly captured by big-game fishermen off the coast of New South Wales, the bait being a garfish trolled upon a light line from a stout rod.

In addition to the true tunny, various tropical fishes of the same order appear periodically along the Australian coasts in larger or smaller schools;

as they are oceanic species, and rarely captured, little is known of their abundance or habits. The Little Tunny (*Euthynnus alletterata*) attains a length of 30 inches, and has been observed in enormous schools off the northern part of the coast of New South Wales. The Large-scaled Tunny (*Grammatorycnus bicarinatus*) was first made known from Western Australia in 1825; though it occasionally appears in considerable numbers, it was not again recognized until 1915, when specimens were secured from New South Wales and southern Queensland.

A.R.McC.

Turkey, Plain and Wild. See BUSTARD.

Turner, CHARLES THOMAS BIASS, born at Bathurst on 16 November 1862, at the age of 19 played with a local twenty-two against the English visiting team of 1881-2 and took 17 wickets for 69 runs. His prominence in the world of cricket, however, dates from his inclusion in the New South Wales eleven of 1886-7. Playing for his colony against Shaw's English team, he secured in first-class matches 52 wickets for 354 runs; in one match he took 13 wickets for 54, in another 14 for 59, and twice bowled Shrewsbury for 0. Against Shrewsbury's team of 1887-8 he took 16 wickets for 79 in the only match played. He visited England with the Australian teams of 1888, 1890, and 1893, his record in eleven-a-side matches being 314 wickets for 3501 runs, 215 for 2724, and 160 for 2202—a total of 689 wickets at a fraction over 12 runs per wicket. In test matches he took 101 wickets for 1670 runs, eclipsing Spofforth's record in this respect by nearly 2 runs per wicket.

Turner was of medium height and compact build; his powers of endurance enabled him to sustain many exceptional calls upon his physical strength. He was a right-hand, medium-pace bowler with an excellent and accurate delivery and a remarkable break from the off whenever the wicket gave him the slightest assistance. The pace of his bowling was accelerated by the spin he imparted to the ball, and whenever in his prime he beat the bat he hit the wicket. On 'shirt-front' wickets his bowling lost some of its deadliness, but his judicious variation of the pace and his use of the fast 'yorker' made him a great bowler under any conditions. No bowler of his type has since been seen in Australia. He is now (1926) an officer in the New South Wales government savings-bank. See CRICKET.

J.C.D.

Turner, SIR GEORGE (1851-1916), born at Melbourne on 8 August 1851 and educated at the model state school, in 1881 was admitted a solicitor and barrister of the Victorian supreme court. In 1887 he was mayor of St. Kilda, and in March 1889 was returned by St. Kilda to the legislative assembly, being regularly re-elected until February 1901. On 22 April 1891 he joined the Munro government as commissioner of trade and customs and minister of health, and retained these portfolios when he took the solicitor-generalship under Shiels in September 1892. The Shiels ministry resigned in January 1893 and Turner went into opposition, but in September 1894 formed a cabinet and held office as premier and treasurer until December 1899. The colony was at this time passing through a serious financial crisis, and it was Turner's competent and cautious administration at the treasury which restored public confidence; he imposed an income tax (the first in Victoria), and passed a factories and shops act, a credit foncier act to provide cheap money for farmers, and an old age pensions act. He represented Victoria at the diamond jubilee celebrations and the imperial conference of 1897, and was given a D.C.L. degree at Oxford and a LL.D. at Cambridge. As premier of Victoria he took a prominent part in the federation proceedings of 1895-9, described under FEDERATION. Defeated after the carrying of federation in 1899, in November 1900 he again became premier, treasurer and commissioner of trade and customs, but resigned on 12 February 1901 to contest the federal elections, and was returned as member for Balaclava. Meanwhile on 1 January he had been sworn in as treasurer in the first (Barton's) federal ministry, and held that portfolio until April 1904, when the Labour party took office; from August 1904 to July 1905 he was treasurer in the Reid-McLean coalition ministry. In 1906 he retired from politics, but continued to practise his profession and interested himself in the state savings bank, being chairman of commissioners at his death on 13 August 1916. (K.C.M.G., 1897; P.C., 1897.)

Turnstone. See WADERS.

Turpentine. See SYNCARPIA.

Turquoise. See GEMSTONES and MINERALOGY.

Turtle Crab. See HERMIT CRABS.

Turtles. See TORTOISES AND TURTLES.

Tusk-fish. See WRASSES.

Twelve Apostles. See CHOUGH, WHITE-WINGED and GREY JUMPERS.

Twenty-eight. See PARROTS.

Two-up is a game of chance which appears to be so far an Australian institution that it is referred to by the jocular as Australia's 'national game,' and by the serious-minded as a 'national evil.' In the view of the legislatures of the various Australian States it is pure gambling, and, as such, is illegal. The game is probably an offshoot of the old British pitch-and-toss; it was widely played in the early gold-digging days, but was known in Australia long before that.

A place where the game is played—be it room, quarry, sand-pit, or street-corner—is known as the 'school,' and the term is sometimes applied to the players collectively. Police raids on schools are not uncommon, and the resultant proceedings frequently reveal the fact that in cities they are elaborately appointed and have their floors padded to lessen the sound of clinking coins. In order to prevent the entrance of police spies, city schools are as exclusive as the most fashionable club, and a stranger's credentials must thoroughly satisfy the door-keeper before he is admitted. A famous school in Melbourne could be reached only after negotiating tunnels and barbed-wire entanglements. In country and suburban areas players are usually content with a gum-tree environment on a river-bank, or with a shed, barn, or deserted quarry; but in all cases 'scouts' are employed to keep a look out for approaching 'cops.' In either city or country a school may accommodate many scores of players, and at times hundreds of pounds change hands over a single throw of the pennies. Motor-buses and other vehicles are often chartered by the 'management' to convey 'scholars' to a distant school.

The players being assembled in a ring, any one of them may elect to be, or may be chosen

as, the first spinner. He then hands to a 'boxer' (the man who places the spinner's bets) the sum for which he is prepared to back the chance of the coins he is about to spin falling heads up. Before any other bets are made his money must be covered; then the players may bet with each other as to the result—heads or tails as the case may be. When told by the boxer that all bets have been set, the spinner, or sometimes the 'ringy' (ringkeeper), places two pennies (supplied from the school) tails up on a 'kip,' which the spinner holds by the first two fingers and thumb, and with an upward movement of the arm and a sharp turn of the wrist he pitches the coins in the air. Should they fall 'two ones' (one head and one tail) the spin is abortive, and they are again thrown up. Any bettor who is dissatisfied with the toss may, while the coins are in the air, 'bar' it, and the spin must be repeated. The spinner continues to spin the coins until they fall tails; then his 'round' ends, and the other scholars, in their turn, have the option to succeed him. Heads are generally spun for, but if tails are chosen the pennies are placed on the kip heads up. The boxer, with the ringkeeper, supervises betting arrangements in general, settles disputes, regulates the succession of spinners, and calls the result of the fall. Acting for the 'game' keeper, he receives from the scholars a percentage of the winnings at the end of a round of spins. From a successful spinner's winnings 3s. in the £ is withheld, but if the police have recently raided the school a further shilling may be exacted, to reimburse the game keeper for the police-court fines which he has paid for his staff and the players who were unfortunate enough to be 'run in.' (The record number of arrests is 156 at Port Melbourne in July 1926.) The bettors who prefer not to spin must nevertheless pass in to the boxer a reasonable percentage of winnings. Occasionally three pennies are used to bring about 'sudden death' —so called because at least two of them must fall heads or tails.

Sundry variants of these main principles add zest to the general appeal of the game. In a well-established school cheating rarely occurs, but there are others in which it is rife, and in which, with the aid of the 'ringy,' a spinner may by devious means 'break the school.' For instance he may 'butterfly' or 'float' the coins—that is to say, while they are apparently twirling over, in reality they are only fluttering from side to side; or a 'nob' (two-headed penny) or a 'grey' (two-tailed) is used. One of the methods of using a two-headed or two-tailed coin is shown in the accompanying figure. Two

A 'crook's' kip in the Police Museum, Sydney.

pennies are placed on the kip, but one of them is held under the spinner's thumb (at A) while the nob or grey is released from the side slot (B) which has been covered by his forefinger. The kip used in a 'straight' game has no slot.

World-wide prominence was given to two-up through its zealous practice by many of Australia's soldiers during the war of 1914-18. It was played by them at every odd moment, even in the trenches, and on armistice day a group of Australians amazed Londoners and the representatives of half the nations of the world by playing their 'national game' in Trafalgar-square. There was then current a jest to the effect that Australian soldiers were very devout —they often gathered in groups and raised their faces to heaven (watching the flight of the coins), lowered them again in devotional contemplation (when the pennies reached the earth), and uttered pious ejaculations.

Two-up figures occasionally in Australian works of fiction, and frequently in the vernacular verse of C. J. Dennis (*The Songs of a Sentimental Bloke, The Moods of Ginger Mick*, etc.), e.g.

Fer 'er sweet sake I've gone an' chucked it clean:
The pubs an' *schools* an' all that leary game;
Fer when a bloke 'as come to know Doreen,
It ain't the same.

Tyrrell, William (1807-1879), born in London in 1807 and educated at the Charterhouse and at St. John's College, Cambridge (B.A., 1831), studied for the ministry of the Church of England, was ordained deacon in 1832 (priest, 1833), held incumbencies at Aylestone in Leicestershire and Beaulieu in Hampshire, and in 1847 was consecrated first bishop of Newcastle in New South Wales. The diocese at that time covered an area extending northwards beyond Brisbane, and Tyrrell, who was luckily a good horseman, spent much of his time in episcopal visitations that reached its most remote parts. These labours were somewhat lightened in 1859, when the diocese of Brisbane took over the districts included in the new colony of Queensland, and again in 1869 by the formation of the diocese of Grafton and Armidale.

Tyrrell had always in mind the legislation under which grants in aid of Church work were to cease at the death of the incumbents to whom they were paid. To provide permanent endowments for future bishops, archdeacons, and parish clergy, incomes for sick and superannuated clergymen, training for students for the ministry, and religious education for the young, he acquired a great deal of station property, the bulk of which—an endowment of over £500,000—was left to the diocese at his death. He died on 24 March 1879 from ailments brought on by his long and rapid journeyings. See Church of England.

Tyson, James (1823-1898), son of a Cumberland yeoman who had enlisted in the army but purchased his discharge in 1818 and came to New South Wales, was born at the Cowpastures on 11 April 1823, and commenced his pastoral career as working overseer to the Vine brothers of Morton Park near Camden. He

was then employed by John Buckland on a station in the same neighbourhood, for whom in 1844 he took up Barwidgee run in the Ovens district. After a spell of similar work for Henry O'Brien of Jugiong, he joined William Tyson, his brother, in forming Gunambill station on the Billabong. At first the enterprise was unsuccessful, and the brothers drove their stock to Towong on the upper Murray, where William ran a dairy while James acted as farm labourer and drover for his richer neighbours. Meanwhile they omitted to renew their licence for Gunambill, and when in 1851 the pastoral lands were thrown open for tender it was acquired by another squatter. In 1851, however, their fortune changed. James Tyson took droves of Riverina cattle to the diggings at Bendigo, opened a butcher's shop there, and in four years had saved enough money to buy up several Riverina runs, among them Deniliquin (125,000 acres) and Juanbong (64,000 acres); soon afterwards he bought Heyfield in Gippsland, Felton on the Darling Downs in Queensland, and several stations along the Warrego. For 20 years he thus accumulated wealth, giving his business personal management in the smallest details and remaining always the drover-squatter. When in 1883 the McIlwraith ministry introduced a bill for the construction of a land-grant railway from Charleville to the Gulf of Carpentaria—under which an Anglo-French-Jewish syndicate would have acquired 12 million acres as payment for laying the rails—Tyson offered McIlwraith a loan of half a million to relieve him from the necessity of driving such a bargain. In 1892, at a moment of financial depression, he took up £250,000 worth of treasury bills, and McIlwraith acknowledged his help by appointing him to the legislative council, where his knowledge of the land question made him a useful member. He died at his Felton run, near Cambooya, on 4 December 1898; his estate in Queensland, New South Wales, and Victoria realized about two and a half millions. Entirely without ostentation or affectations of any kind, he became during his lifetime one of the bush traditions of eastern Australia, and is celebrated in A. B. Paterson's 'T.Y.S.O.N.' J.V.C.-B.

U

Ullathorne, William Bernard (1806-1889), born at Pocklington in Yorkshire on 7 May 1806, was a lineal descendant of Blessed Thomas More; his mother was a relative of Sir John Franklin (q.v.). At the age of 13 Ullathorne persuaded his parents to allow him to go to sea as an apprentice; after 3½ years spent in the Baltic and Mediterranean seas, he abandoned the sea, and before the age of 17 had entered Downside Abbey as a postulant for the Benedictine Order. He had not yet received his first Communion, nor had he been confirmed. His prefect and novice-master was Father Polding (q.v.), who was to be the first bishop and archbishop of Sydney. On 12 March 1824 Ullathorne received the religious habit, was professed on 9 April 1825, ordained deacon in 1830, and priest in September 1831.

Father Polding having refused to accept an appointment as vicar apostolic of the Mauritius (in which Australia was included), Dr. Morris accepted the charge, and Ullathorne agreed to go out to New South Wales to act as his vicar general. This appointment to the Australian mission was welcomed at the colonial office, since Father Therry (the senior priest in Sydney) was at variance with the governor and had been suspended from his official chaplaincy. Ullathorne therefore was given official standing, with a liberal salary and travelling allowances. He sailed from England in 1832, called on the way at Hobart (his remarks on the mission there and its priest are unwarrantably scathing, owing to his lack of experience of colonial disadvantages), and landed at Sydney on 18 February 1833. His arrival in the capacity of vicar general was a surprise to the priests in the colony. When Ullathorne arrived there were four priests on the mission—Conolly at Hobart; McEncroe, Dowling, and Therry in New South Wales. The situation was critical, for Therry's zeal had become intemperate and was about to lead to a clash with the government, which Governor Bourke was anxious to avoid. Ullathorne's arrival was opportune, and his management of the affairs of the Church was masterly. We must not, however, forget that the Church had already been founded in the colony, and that two influential Catholic laymen held high government posts—Roger Therry, commissioner of the court of requests, and J. H. Plunkett, the solicitor-general. Moreover, Bourke's church act made building on the foundations already laid a far easier task than Ullathorne's predecessor had experienced under Darling and Macquarie. To understand the adroitness of his administration one must study his many letters in the *Historical Records of Australia*; his *Autobiography* gives a more intimate account. Despite its egotism, which was more or less characteristic of the writer, the *Autobiography* does not exaggerate his work, which embraced every inhabited settlement under government control—even Norfolk Island, which he visited in 1834.

On 13 September 1835 Dr. Polding arrived at Sydney as first bishop, Ullathorne continuing to act as vicar general. From this time until his final departure, Ullathorne's was the brain that thought out every plan; on his shoulders he willingly bore the brunt of every attack that was levelled against the Church in Australia. The bishop never lost his popularity, for Ullathorne focussed all opposition on himself. To him everyone looked for a reasoned reply in the most convincing language—when the Anglican bishop attacked Dr. Polding; when a judge of the supreme court attacked Catholicism; when it was necessary to expose to the English proletariat the 'horrors of transportation,' or to convince the royal commission of 1837-8 of the immediate necessity for abolishing convictism in Australia. No man was more hated by the wealthy supporters of convict labour; no man was more feared by anti-Catholic bigots; no man was at that time more necessary and useful to the Church in Australia. In 1840 one of the most memorable of his works—his *Reply to Judge Burton on the State of Religion in the Colony*—was published in Sydney. This judge had published in book form a bitter attack on the Catholic Church. Ullathorne's reply was in the nature of a history of the Catholic Church in the colony and a comparison of its condition with that of the Church of England. The work proves his pre-eminence as a controversialist, as well as his literary powers.

In 1836 he sailed for Europe. After reaching England he published *The Catholic Mission in Australasia* (the most important document in Australian Catholic history to that time), and *The Horrors of Transportation briefly Unfolded*, which was written to expose convictism in Australia, and thus to deter the misguided proletariat of England from committing petty crimes in the hope of being transported. Meanwhile he went to Rome and submitted to Propaganda a *Report* on the Catholic Church in New South Wales, which led to a more intimate understanding there of colonial conditions. Returning to England, he gave evidence for two days before the parliamentary commission on transportation (1838): both the nature of his evidence and the authority which his unique experience gave him deeply impressed the commission, and lengthy quotations from his evidence were embodied in the final *Report* that recommended the abolition of transportation. Many historians have overlooked the great influence of Ullathorne on this decision; on his return to Sydney, however, it was soon evident, from the attacks made on him by the supporters of the system, that he was regarded as the chief inspirer of the commission's recommendations. The years that followed were made bitter by these attacks.

This bitterness, genuine fatigue after his strenuous missionary career, and the keen in-

sight which enabled him to see that it would be impossible for a man of his energy to continue working under the easy-going Bishop Polding—all these considerations soon led him to realize that his work in Australia was already done. In 1840 he left Australia with Bishop Polding, and together they formulated a scheme for the establishment of a hierarchy in Australia, of which the Holy See approved. Ullathorne was nominated to more than one see, but refused all, retired to the mission at Coventry, and after building a church there was appointed vicar apostolic of the western district of England, with the title of Bishop of Hetalona. Two years later he was transferred to the episcopal charge of the central district, of which he remained bishop for 41 years. In 1848 he was chosen by the English bishops to negotiate at Rome for the restoration of the hierarchy in England, and on 29 September 1850 Pope Pius IX proclaimed the English hierarchy. Ullathorne was then appointed archbishop of Birmingham, and was later chosen by the English bishops to succeed Cardinal Wiseman at Westminster; but Pope Pius IX overruled the choice and appointed Cardinal Manning. In 1870 Ullathorne attended the Vatican council. In 1888 he obtained permission from Rome to resign his see, was appointed titular archbishop of Cabasa, and retired to Oscott College, where he died in the following year.

His works include: *A Reply to Judge Burton* (Sydney, 1840); *Endowments of Man* (London, 1880); *Groundwork of Christian Virtues* (1882); *The Immaculate Conception, History of Restoration of English Hierarchy* (1871); *The Dollingerites* (1874); *Answer to Gladstone's 'Vatican Decrees'* (1875); and numerous pamphlets. For the first half of his life we have an *Autobiography* (London, 1891) and *Letters of Archbishop Ullathorne* (London, 1892): *Characteristics from the Writings of Archbishop Ullathorne* (London, 1889) give an inadequate account of his later life. *The Life and Times of Bishop Ullathorne* by Dom Cuthbert Butler (London, 1926) is surprisingly inadequate in its treatment of the Australian period.

E.M.O'B.

Ulmaceae, a family of plants closely related to the Urticaceae, whose chief genus, *Ulmus* (the elms), ranges over the north temperate zone. In Australia the family is represented by a few genera long classed with the Urticaceae. *Trema* is dealt with separately; *Celtis* is largely tropical or subtropical—its three indigenous species occur, usually in coastal brushes, from New South Wales northwards. *C. philippinensis* has a useful timber, and that of *C. paniculata,* a soft, white, pliable wood, is used in making hoops for casks. *Aphanathe philippinensis,* known in New South Wales as 'tulip-wood'—a name applied to several other trees (see HARPULLIA)—extends to the Philippines; its timber is used for lining-boards and ceilings.

Umbelliferae, a family of plants of world-wide distribution, especially numerous in northern temperate regions; 145 species occur in Australia. It consists of herbs and shrubs, mostly with small flowers in umbels, either in compact heads or on slender stalks radiating from the apex of a common flower-stem, and surrounded by an involucre of leafy bracts; in many genera elongated receptacles (vittae) containing an essential oil are attached between the ribs of the twin one-seeded carpels. The family includes many aromatic, culinary, and medicinal herbs. *Xanthosia rotundifolia* is the Southern Cross of Western Australia. See ACIPHYLLA, ACTINOTUS, APIUM, DAUCUS, ERYNGIUM, HYDROCOTYLE.

Universities. The university of *Sydney,* which was the first established in Australasia, arose out of the Sydney College (see SCHOOLS), whose proprietors in 1849 petitioned the New South Wales legislative council 'for the adoption of measures to convert the institution into an University.' A select committee, among whose members were William Charles Wentworth (q.v.), Edward Deas Thomson (q.v.), John Hubert Plunkett (q.v.), Charles Cowper (q.v.), Robert Lowe (see SHERBROOKE, LORD), G. R. Nichols (q.v.), Charles Nicholson (q.v.), and James Macarthur (q.v.), on 21 September 1849 recommended 'the policy of founding without any further delay, upon a liberal and comprehensive basis, a University which shall be accessible to all classes and to all collegiate and affiliated institutions which shall seek its affiliation.' In 1850 an 'act to incorporate and endow the university of Sydney' provided for the appointment of a senate of 16 fellows, and sanctioned a statutory annual grant of £5000. At a later date the university was given by royal charter (bearing date 27 February 1858) the right of granting degrees in the faculties of arts, law, and medicine, and was 'entitled to rank, precedence and consideration in the United Kingdom and in our colonies and possessions throughout the world, as fully as if the said degrees had been granted by any University of the said United Kingdom.'

Three chairs—in classics, mathematics, chemistry and experimental physics—were founded in 1851, and the first professors were: of classics, John Woolley, formerly fellow of University College, Oxford; of mathematics, Morris Birkbeck Pell, fellow of St. John's College, Cambridge; of chemistry and physics, John Smith, formerly assistant professor of chemistry in Marischal College, Aberdeen.

The university was inaugurated in October 1852. The senate was empowered to purchase the Sydney College, but its buildings were inadequate, and land was acquired by grant from the government at Grose Farm on the western edge of the city—a block of 128 acres, later increased to 141¼. This land was dedicated in 1855 to educational purposes, provision being made for sub-grants by the university senate for four colleges in connection respectively with the Church of England, the Church of Rome, the Church of Scotland, and the Wesleyan Methodists, and also for subsidies towards providing them with buildings and with salaries for their heads. St. Paul's College (Church of England) was established in 1854, St. John's (Roman Catholic) in 1857, St. Andrew's (Presbyterian) in 1867, Wesley College (Methodist) in 1910, and the Women's College (on a non-sectarian basis) in 1894. All were built on university land and subsidized on equal terms. The training college for teachers, built in the university grounds, was opened in 1920. It is a government institution and is maintained from public funds.

Most of the university buildings have been provided from public funds. The main building, designed by Edmund T. Blacket, stands conspicuously on a ridge between the suburbs of Newtown and Glebe. In front lies the 52-acre Victoria Park, vested in the city council. Behind the university buildings the land falls to a lower level, where the sports grounds are situ-

ated, and beyond, on a second ridge, stand the affiliated colleges and the Royal Prince Alfred hospital. The main building, built of Pyrmont sandstone and based on English 18th century work, is an important example of the Gothic revival of the last century; its façade, built in 1854-60, is 410 feet long, with a central tower 90 feet high, in which a carillon is soon to be installed as a war memorial; the quadrangle and cloisters, which formed part of Blacket's design, are almost completed. South of the main building on the same ridge is the medical school; other schools of various degrees of architectural merit lie on the western slopes behind. The great hall, 135 feet long, 45 feet wide, with an internal height of 70 feet, is the most distinguished example of Gothic architecture in Australia. It contains portraits in oil of benefactors, chancellors, fellows of the senate, and professors, together with marble statues of William Charles Wentworth and John Henry Challis. The roof is embellished with beautiful wood-carvings, and the floor is of coloured marble in gray and white squares. On the southern side is an oriel window of Caen stone. Stained glass windows on the eastern and western sides represent the founders of colleges at Oxford and Cambridge, and another large window contains portraits of kings and queens from William the Conqueror to Queen Victoria. High in the walls to the north and south are other stained glass windows of historical celebrities in the arts, literature, and science.

In 1852 24 matriculants were admitted; in the jubilee year, 1902, 730 students were in attendance; in 1925 the number had increased to 2611, of which 667 (25.5 per cent) were women. In 1852 lectures in arts subjects only were given, these being provided for by the statutory endowment of £5000. In 1880 the endowment was raised to £10,000 per annum, and extra sums granted annually by parliament enabled the senate to provide a chair of anatomy and physiology and lecturers for the medical school. The faculty of science was established in 1882, with lectures in engineering, and in 1884 parliament voted a sum for the establishment of evening lectures. A chair of law was founded in 1890. In 1892 the endowment and additional grants made from public funds amounted together to £15,900; in 1925 the total was £72,870. In addition benefactions, such as those of Captain Hovell (q.v.) (£6000), John Henry Challis (£276,000), Sir Peter Nicol Russell and his widow (£100,000), and Sir Samuel McCaughey (one-third of his estate, vested in trustees and producing an annual income of about £21,500), have made possible the establishment of professorships and lectureships. Degrees are now given in arts, law, medicine, science, engineering, dentistry, agriculture, veterinary science, architecture, and economics; diplomas are given in public health, tropical medicine, education, psychiatry, commerce, and journalism. The total number of degrees conferred since the foundation of the university is 9099.

The first senate was constituted on 24 December 1850. Under the university amendment act of 1912, the senate consists of 25 fellows—four appointed by the governor, one elected by the legislative council, one by the legislative assembly, five representatives of the teaching staff, ten elected by graduates, and three co-opted by the fellows.

University extension lectures in individual subjects were instituted in 1886 in order that persons unable to study for degrees and to attend the ordinary lectures, might benefit by the work of university teachers. In 1925 25 courses of lectures, with an attendance of 13,225, were delivered in Sydney, its suburbs, and country towns. Tutorial classes, organized, supervised, and controlled by a committee, enrolled 1575 men and women students in 61 classes, including psychology, municipal administration, economics, history, geography, literature, physiology, public health, and the art of expression.

Senior and junior public examinations, similar to those held at Oxford and Cambridge, were inaugurated in 1867, but were replaced in 1916 by the 'intermediate' and 'leaving certificate' examinations conducted by the university in conjunction with the department of education. On the results of the leaving certificate examination there are awarded annually 200 exhibitions tenable at the university; the tenure of these is not to exceed five years, except for medicine, where it is 5⅔ years.

The Fisher Library (see LIBRARIES) contains 160,000 volumes, and about £3500 is expended annually for books, periodicals, and binding. The structure, which is in keeping with that of the main building, forms part of the quadrangle. Its reading-room measures 122 feet by 50; it accommodates 300 readers, and its interior and exterior are enriched with carved escutcheons. Two war memorial windows have been placed in it, and also a roll of honour containing the names of 200 graduates and undergraduates who gave their lives in the war of 1914-18; £17,000 has been subscribed for the installation of a carillon as a war memorial. The Nicholson museum of Egyptian antiquities and Roman sculpture, Roman and Etruscan sepulchral remains and vases—many being of priceless value—was presented by Sir Charles Nicholson (q.v.). In the Macleay Museum there is a valuable collection of natural history objects bequeathed by Sir William Macleay (q.v.), who also endowed the curatorship.

The munificence of private benefactors, in addition to those already mentioned, has been notable. The oldest benefaction is a legacy of £500 from Solomon Levey to the Sydney College in 1853, transferred in the following year to the university. For the foundation of scholarships and bursaries well-known citizens, including Thomas Barker, Sir Edward Deas Thomson, Sir Daniel Cooper, W. C. Wentworth, Sir Charles Nicholson, John Frazer, Thomas Walker, J. B. Watt, and others, have given various sums of money. Legacies have also been received from Mrs. M. H. Dalley, Miss Elizabeth Caird, W. O. Watt, and others. Valuable also are the Aldridge collection of minerals (£7050) the gift of Sir Hugh Dixson, and a legacy of £7135 from the late J. F. Archibald for the promotion of cancer research.

On the university grounds are The Union (a club-house for men somewhat on the lines of the Oxford Union), and Manning House for women. In both of these, which were built from university funds, are centred the several undergraduate and graduate interests—literary, social, and sporting; each contains a refectory, reading- and games-rooms, and the former a large hall for debates and meetings; all students attending lectures are required to become members.

Melbourne.—The university of Melbourne was established by act of parliament (16 Vic. No. 32) on 7 January 1853, only 18 months after the separation of Port Phillip from New South Wales and its conversion into the colony of Victoria. The bill was introduced into the legis-

lative council by H. C. E. Childers (q.v.), and Redmond Barry (q.v.) and Childers were the first chancellor and vice-chancellor respectively. The original endowment was £9000 per annum, and 140 acres of land were reserved for university purposes.

On 3 July 1854 the foundation-stones of the buildings (four dwelling-houses for professors, and lecture-rooms for the students) were laid by the governor (Sir Charles Hotham), and in the following April the university was opened with 16 matriculated students. Lectures were first delivered at the Exhibition building in William-street, but in October 1855 the university buildings themselves became available. Four professors had been selected by a committee in England for the chairs of (1) Greek and Latin (Irving), (2) mathematics, pure and mixed (Wilson), (3) natural science (McCoy), and (4) modern history, modern literature, political economy and logic (Hearn).

The number of graduates admitted to the degrees of master and doctor (M.A., M.D., LL.D., and Mus. Doc.) having reached 100, the senate was constituted by proclamation in June 1867, and thereafter, until the passage of the University Act of 1923, vacancies in the council were filled by the senate. The present council consists of 31 members, viz., eight appointed by the governor-in-council (one representing the legislative council, two the legislative assembly, one commercial interests, one agricultural interests, two industrial interests, and one technical schools); ten elected by graduates; three by the professors; one by the junior teaching staff; two by undergraduates; three ex officio; and four (two being heads of colleges) co-opted.

In 1855 17 undergraduates were in attendance upon lectures; in 1879, 263; in 1900, 531; in 1910, 1237, while the number attending in 1926 rose to 2600, of which 500 were women. Women students were admitted to matriculation and to all courses except medicine in 1879 and to the medical course also in 1887. The total number of degrees already conferred is 10,237.

As the colony developed, so did university teaching expand. The law school was established in 1856, the school of civil engineering and architecture in 1860, the medical school in 1883, the school of mines in 1893, of education in 1903, of dental science in 1905, of agriculture in 1906, of veterinary science in 1909, of architecture (as a separate department) in 1914, of commerce in 1925. The following faculties are now in existence: arts, law, medicine, engineering, science, agriculture, veterinary science, dentistry, education, and commerce, with 22 professors, 5 associates and a teaching staff of 142. Matriculation examinations or their equivalents have been held from the year 1856.

The buildings are situated in a beautiful demesne and are being added to in such measure and at such rate as government grants and private benefactions permit. The Wilson Hall is a fine example of private munificence. Sir Samuel Wilson notified to the chancellor (Sir Redmond Barry) his desire to defray its cost as a mark of his gratitude both to the land of his adoption and also to the institution most worthy of his aid 'because by the high educational standard which it maintains it enables men of talent and industry, without distinction of station in life or of religious belief, to fit themselves for any position to which they may attain, whether as merchants, professional men, resident landowners, or statesmen, whose duty it will be to guide the destiny of this young but growing country, the future greatness of which no one can doubt.' In 1874 he placed £30,000 at the disposal of the university, and this amount was increased, by interest on the investment, to £40,000 by the time the building was completed in 1881. The Wilson Hall, built of freestone and Pyrmont sandstone, was intended to be an extension of the east wing of the main university building, but actually stands forward independently. Its style is perpendicular Gothic, with a length of 140 feet and width of 50; its height to the apex of the roof is 82 feet. The woodwork of the ceiling is mainly copied from Westminster Hall. It has two bays at the dais end, and has bold external buttresses. At the dais end is a very large and richly traceried window. The interior is richly panelled with oak wainscoting and the open roof is elaborately framed and highly decorated with tracery and carving, the hammer-beams being terminated with winged angels holding shields. Over the southern entrance the memorial stone bears the coat of arms and crest of the benefactor.

From time to time new buildings have been added to the university. The busy period followed the year 1904, during which the engineering and geology school buildings were erected and the chemistry and medical schools enlarged. Later were erected buildings for the veterinary school and the conservatorium of music. Since 1921 over £200,000 has been spent in extensions, principally on buildings for the arts and anatomy classes. The university has received very liberal private endowments, of which the larger are those of Sir Samuel Gillott (£34,000); Dr. James Stewart (£25,000) for the medical school; the Hon. Francis Ormond (£20,000) for a chair of music; John Hastie (£19,140), Robert Dixson (£10,837), and David Kay (£15,000) for scholarships.

A library has formed part of the university equipment from its commencement, and now contains 54,000 volumes, which are continually augmented by an annual grant of money and by donations and exchanges.

A students' loan fund has been established. The fund grants loans of money to students who are possessed of ability above the average and who would be unable to enter upon or to continue the university course without assistance from the fund. The borrower is required to find a guarantor for repayment of the loan (not to exceed £100); it is intended for university fees (including those for sports), the purchase of necessary books and appliances, and for living expenses. The repayment must be made at the completion of his course; otherwise the rate of interest increases (the initial rate is 4 per cent). The original capital of the fund, £10,000, is being increased by annual government grants of £2000. Recently the university has established a press of its own. Extension lectures and 'Tutorial Classes' form part of the operating of the institution.

The colleges affiliated to the university are: Trinity (Church of England) opened in 1872, Ormond (Presbyterian) opened in 1882, Queen's (Methodist) opened in 1888, Newman (Roman Catholic) opened in 1918, and the Australian College of Dentistry.

Adelaide.—The university of Adelaide was established by act of parliament in 1874, and in 1881 royal letters patent were issued declaring that the degrees granted by it should be recognized as academic distinctions and be entitled 'to rank, precedence and consideration

throughout the British Empire as if granted by any University in the United Kingdom.'

The university owes its origin to the munificence and public spirit of the late Sir Walter Watson Hughes (q.v.) and Sir Thomas Elder (q.v.), each of whom made a gift of £20,000 towards its foundation. In the act of incorporation the university was endowed by parliament with 'an annual grant from the public revenues of South Australia of five per cent on the capital funds possessed by the university, but not to exceed in any one year the sum of £10,000.' By the amending act of 1923 this limit was extended to £20,000. The act of incorporation also included an endowment 'in land of 50,000 acres and a grant of five acres in the city of Adelaide as a site for the University buildings.' The country lands were subsequently purchased for £40,000 by the government, and the city area has been extended by further grants. Parliament has from time to time increased the annual grants, which in 1925, combined with the statutory grants, amounted to £42,747. The total annual income from all sources in 1925 was £81,660.

The original professorships were four in number. There are now 19 professorships, 29 full-time and 72 part-time lecturers, and 50 assistants including technicians. Lectures are given and degrees granted in arts, science, law, medicine, dentistry, engineering, and music. Diplomas are given in commerce, music, education, economics and political science, and in some branches of applied science. The university of Adelaide was the first Australian university to grant degrees to women (as authorized by act of parliament in 1880).

Lectures were first given in March 1876, and were attended by eight matriculated students and 52 non-graduating students. The number of undergraduates in 1925 was 732, of post-graduates 78, of non-graduating students 676, and there were 632 students attending the Elder conservatorium. Leaving and intermediate public examinations and examinations in music are conducted in Adelaide and in country centres, and courses of lectures under the university extension scheme are given at several important country towns. See MUSIC.

The university has been splendidly supported by public-spirited citizens. The list of benefactors and endowments includes the following: J. H. Angas, £60,000 to endow a chair of chemistry and £4000 for scholarships; Sir Thomas Elder (who, in addition to his gift at the foundation of the university, endowed by bequests the schools of arts, science, medicine, and music), benefactions totalling nearly £100,000; Robert Barr Smith, £9000 towards the library, the amount being afterwards raised by members of the family to £20,000 as a permanent endowment; Peter Waite, an endowment of £100,000 (including a large estate and mansion) to advance the cause of education in agriculture, forestry, and allied subjects; the family of John Darling, £15,000 towards a building for the medical school; Mrs. G. A. Jury, £12,000 to found the Jury professorship in English language and literature; Mrs. Jane Marks, a bequest of £30,000 as an endowment for the medical school in memory of her husband; Mrs. A. M. Simpson and Miss A. F. Keith Sheridan, a joint-bequest of property of the value of £20,000 for medical research; Sir Langdon Bonython, a settlement of £40,000, which will be available in 1930 for the erection of a great hall. The private endowments of the university amount approximately to £336,000.

University of Tasmania.—The Tasmanian University Act (53 Vic. No. 41), assented to 5 December 1889, established the university. Its governing body is the council, consisting of 19 members, nine of whom are elected by the senate and eight by members of both houses of parliament, the minister and director of education being members ex officio.

The university is situated in the Queen's Domain, and the property known as The High School of Hobart, with adjacent land, was vested in the university in 1892. The government subsidy for the year 1924-5 was £11,470. Letters patent of date 30 August 1915 grant recognition of the university degrees to the rank, precedence, and consideration of other universities throughout the British Empire.

There are five faculties: arts, science, engineering, law, and commerce, and degrees are granted therein. The teaching staff comprises seven professors and 16 lecturers. The university conducts the intermediate and leaving examinations, certain subjects of the leaving examination being required as qualifications for matriculation. The number of matriculated students in 1925 was 1057, and of students attending university lectures 168.

By a bequest of £5000 Professor Pitt Cobbett (late professor of law in the university of Sydney) endowed a lectureship in economics. The trustees of the late John Ralston provide £800 per annum for biological research work.

University of Queensland.—The university of Queensland was incorporated and endowed by an act of parliament which received the royal assent on 10 December 1909. The foundation of the university was the outcome of the work of the Queensland university extension council formed in 1893. On the day that the royal assent was given to the university act the governor of Queensland, Sir William MacGregor, dedicated to the use of the university the building formerly used as government house. This was done in the presence of a large assemblage which included the premier of Queensland, William Kidston, to whose efforts the passing of the act was due.

The senate of the university consists of 20 persons. The first senate was appointed by the governor-in-council, the names of its members being gazetted on 15 April 1910; Sir William MacGregor and R. H. Roe were elected chancellor and vice-chancellor respectively. There followed the appointment of professors to the following chairs: classics (J. L. Michie); chemistry (B. S. Steele); engineering (A. J. Gibson); mathematics and physics (H. J. Priestley).

On 14 March 1911 the first term commenced; 80 undergraduates were matriculated and attended lectures. On 1 June was held the inaugural ceremony, at which representatives from most of the universities of the Empire presented addresses. The second academic year commenced with 169 students. In 1924 457 (133 women) undergraduates were in attendance at lectures or working under the director of the correspondence schools. A statutory declaration is accepted as sufficient to obtain exemption from attendance at lectures and to become an external student whose studies are guided by the director of correspondence classes.

There are five faculties: arts, science, engineering, law, and medicine. Queensland is one of the universities which, to ensure a uniform

standard and method throughout Australia, conducts public examinations in music. It was the first Australian university to provide a curriculum and give a diploma for journalism. The professorial and teaching staff numbers 31, and deals with the following subjects: biology, chemistry, applied chemistry, classics, English, French, German, history and economics, economic and colonial history, geology, mathematics and physics, psychology and education, philosophy and logic, history of architecture and building construction, surveying, mechanical and electrical engineering.

The government endowment for the first seven years was £10,000; in 1924 it was increased to £16,725. The colleges affiliated to the university are: Emanuel (Presbyterian), St. John's (Church of England), King's (Methodist), the Women's College, and St. Leo's (Roman Catholic).

University of Western Australia.—The movement for the establishment of a university was in existence as early as 1898, when the Adelaide university extension committee was formed and Adelaide university co-operated with that committee in holding examinations for junior, senior, and higher public certificates, and for a portion of the degree work. In 1901 the legislative council adopted a motion advocating the establishment of a university. The incorporation and endowment of the university of Western Australia dates from 16 February 1911, when the University Act 1911 received the royal assent. The first senate was proclaimed in the government *Gazette* of 13 February 1912, and convocation was declared to be in existence in February 1913, when the number of persons qualified to be members had reached 60, the minimum prescribed by the act. Eighteen members, of whom one-third are appointed by the governor-in-council, compose the senate. Its first chancellor was Sir J. Winthrop Hackett, whose influence and financial help were great factors in the initial stages. Under the University Endowment Act 1904 certain crown lands (about 4146 acres, chiefly of Perth suburban and country town-site lots) provide the endowment of the university. The government subsidy in 1925 was £18,500.

Degrees are granted after attendance upon lectures and examinations in the faculties of arts, science, and engineering, and in the department of agriculture. The courses for the several degrees in arts, science, and agriculture extend over a period of not less than three years, and for engineering of not less than five years. In addition to the bachelor degree in each of the foregoing faculties the university grants the master degree in arts, science, and engineering, and the degrees of doctor of letters and science. There are also faculties of law, medicine, and music constituted for the purpose of admission to *ad eundem* degrees. Evening lectures are provided in the faculty of arts and in certain science subjects.

In the early days of the discussion as to the establishment of a university it was proposed that it should be an examining university only, but that idea was abandoned. At its commencement in 1913 93 matriculated students enrolled out of a total attendance of 184. The progress of the university is denoted by the increase in 1925 to an enrolment of 357 students, of whom 354 are matriculated. No fees are charged to students except for the annual examinations.

R.A.D.

Of the Australian universities in general it may be said that their methods and standards of teaching, as well as their administration, are very much the same. There is regularly a council or senate, and there is also, under different names—such as senate (where the council is not itself so called) or convocation—a body of graduates which possesses certain powers of election and also a certain control over new regulations. Professorial boards and various faculties deal with educational details. While the State governments, which provide grants and subsidies, may have their representatives on the highest governing bodies, they have been wise enough to leave alone the educational and financial management. Appointments are made by the governing body on such terms as it may decide, but the general principle now prevailing is that retirement of teachers shall take place at a fixed age. In the making of appointments to the teaching staff there has happily been no limitation as to the sources from which the teachers shall be drawn. There is doubtless a growing tendency to appoint, other things being equal, a known and tested alumnus of the university itself, but such a practice has not hitherto been carried to any injurious lengths. The consequence is that the Australian universities have been served by professors and lecturers drawn from Oxford, Cambridge, Dublin, Edinburgh, Glasgow, Aberdeen, London, the newer universities of Great Britain and Ireland, various colonial universities, and elsewhere. From the blending of these various elements there are excellent results in the way of liberal and progressive programmes of study, and of rational scopes of examination and standards of degrees. In the last respect the Australian universities can compare favourably with any others in the British Empire.

So far as there is any marked difference between one university and another, it lies in the existence or non-existence of compulsory attendance at lectures. All the universities recognize the danger of a 'half-baked' acquirement on the part of those who are never inside the lecture-rooms, but there are geographical or economic conditions which would create cases of hardship and discouragement, and therefore for the most part the universities at present either exert no compulsion or are liberal in concessions. A certain use of correspondence classes is naturally regarded as merely a temporary makeshift. Exemption from attendance cannot, however, apply to the professional courses. The aim of legislators and of the universities themselves has been to carry the ramifications of direct university influence as far as possible among the people. Hence, apart from the stocking of the professions and the staffs of the higher educational institutions, a particular effort has been made to bring the teachers of the state (or public) schools into touch with the universities. Hence also the establishment of 'extension' lectures and 'tutorial classes.'

The newness of the Australian universities has been but a newness of date, not a rawness of methods and standards. The teaching staffs have mostly consisted of men not only of high attainments but also possessed of the most recent scientific or literary conceptions. Many professors have attained a widely recognized eminence. Of international note have been, for example, in mathematics Bragg and Lamb (both formerly of Adelaide), in classics Badham (Sydney) and Tucker (Melbourne), in anthropology Spencer (Melbourne); in anatomy the sadly short-lived Hunter (Sydney, of which university he was himself an alumnus) was acquiring a distinguished name. Of wide recognition have

also been Hearn and Pearson (Melbourne) in the domain of history, Scott (Sydney) in that of classics, MacCallum (Sydney) in that of English, Wilson (Sydney) in anatomy, and Masson (Melbourne) in chemistry. Dr. C. J. Martin (Sydney, and subsequently professor at Melbourne) is now director of the Lister Institute in London. Other teachers have been regular contributors to the scientific journals of the empire and abroad, and a somewhat unusual proportion have attained to the distinction of F.R.S. A large number have rendered conspicuous public services on technical or educational boards and commissions, and as advisers to States or Commonwealth in matters in which they have been experts. The number of reputable books produced by Australian university teachers—often under geographical disadvantages—is somewhat remarkable. Perhaps their very isolation has done something to evoke a special originality. Meanwhile from the ranks of Australian alumni there emerge such conspicuous names as those of Elliot Smith, W. Rosenhain, William Sutherland, and John Monash. Articles on all these names—which are cited only as outstanding instances, and by no means as exhausting the list—will be found elsewhere in this encyclopaedia.

Uranium. See MINERALOGY.

Urticaceae, a large and widespread, chiefly tropical, family of trees, shrubs, and herbs, of varied habit, with entire or toothed (rarely divided) leaves. The small flowers are arranged in spikes, clusters, or heads; fruit a small drupe or nut—in some genera the fruits of the whole inflorescence are enclosed in a fleshy receptacle. The most important Australian genus is *Laportea* (q.v.). See CUDRANIA, LAPORTEA, MORACEAE, PIPTURUS, TREMA, ULMACEAE.

V

Vanadium. See MINERALOGY.

Van Diemen, Anthony. See AUSTRALIA, DISCOVERY OF.

Van Diemen's Land. See TASMANIA.

Van Diemen's Land Company, THE. In 1822 James Dixon, who as master of the ship *Skelton* had brought free settlers to Tasmania in 1820, suggested in a pamphlet the formation of a pastoral company to settle in the northern districts of the island. In 1824 the suggestion was repeated by Edward Morrison Curr, who in 1820-3 had lived in Tasmania; and on 12 May of that year he became secretary of a London syndicate which proposed to take up half a million acres there. Sorell, just returned to England from his governorship, backed the proposal, and in April 1825 the colonial office offered a block of 250,000 acres in the north-west of the island, the land to be valued at 2s. 6d. per acre and a quit-rent of 30s. per cent on the valuation—£462 15s. in all—to be payable after the first five years. In June the company was formed and the offer accepted, the charter being issued in November; headquarters in London was to be managed by a governor, a deputy-governor, and 18 directors, Curr being made chief agent and manager at the Tasmanian end. In 1826 Curr with a staff of five reached Hobart, established his office there, and selected the first block of 20,000 acres at Circular Head, where the *Tranmere* landed cargo, stock, and some free mechanics; explorations inland opened up in 1827 good country on the Don and Arthur rivers, and the colonial office agreed not to insist on confining the area to a single block—six blocks were therefore acquired, at Woolnorth near Cape Grim (50,000 acres), Hampshire Hills (10,000), Middlesex Plains (10,000), Circular Head (20,000), Surrey Hills (150,000), and on Robbins, Walker, and Trefoil islands (10,000). Cultivation was at once begun, 100 acres being broken up at Circular Head in 1827 and another 60 in 1828, and put under wheat, barley, oats, turnips, and potatoes. Sheep were also imported—50 Cotswolds in 1826, 310 Saxon merinos in 1827—and 2300 more were purchased in the colony; in 1830 25 stud Leicesters were brought out, and Adolph Schayer, a Silesian breeder of some reputation, was engaged to look after the flocks. Road-making began in 1828, when the establishment at Emu Bay was connected with the Hampshire and Surrey Hills estates and through them with Launceston. By 1835 671 acres were being cultivated, and the live stock amounted to 3935 sheep (2086 of them merinos), 1307 cattle, 144 horses, and 112 swine. In 1843 it was reported that 68 tenant-farmers had 8147 acres of land between them. The area held by the company was gradually enlarged to over 400,000 acres.

The company suffered, however, both from inexpert management and from unpopularity. The imported farm-managers paid too little attention to local conditions, and persisted in conforming to European practice; large sums of money were spent in useless directions, while crops were being ruined by lack of drainage after excessive rain. The adaptability of the Circular Head land to potato-growing, which has of late years been the most prosperous of the company's undertakings, took long to discover. Unpopularity was incurred at first by the manager's persistent demands for convict servants, which alarmed the Hobart and Launceston settlers by threatening to deprive them of much-needed labour; before long the existence of a monopolist company aloof from the main body of settlement bred the usual, if unreasonable, suspicion that favouritism was being or would be shown—if not by the authorities at Hobart, then by those in Britain. In actual fact the English shareholders lost heavily, and in 1853 the company had to be reconstructed.

The Victorian gold-rush led to an increased demand for grain, potatoes, and timber; on the other hand, many settlers crossed the Strait to the diggings and did not come back. The company tried to recoup its expenditure by selling land, but by 1858 only 12,000 acres had been sold. Of its 403,000 acres only 3000 were under cultivation, and £3000 a year was received from rents. The discovery of tin at Mount Bischoff by 'Philosopher' Smith (see SMITH, JAMES) in 1871 benefited the company greatly. The Mount was outside its holdings, but it held the land round Emu Bay, which became the port for the field. A tramway to the Mount was by 1878 completed to Rouse's Camp, 44 miles from Emu Bay; in 1884 the wooden rails were replaced by iron ones and the horse-traction by steam-power. In 1887 the company, recognizing that its heavily timbered lands were its best asset, began to clear them and to put the cleared land under grass; the export of timber thus became of increasing importance. Soon afterwards the building of a railway to Zeehan by a private company made Emu Bay the principal port for the west coast mining-fields. Early in the 1900s the company set itself to encourage closer settlement; sales of land, which had previously been intermittent, were regularly organized in 1912; the islands were sold, but the Woolnorth property was still devoted to grazing. Negotiations initiated in 1925 for using the company's timber in the making of paper-pulp are still incomplete, as the protection given to this manufacture by the Commonwealth tariff is reckoned insufficient by the promoters.

E.W.

Vaughan, ROGER WILLIAM BEDE (1834-1883), born at Courtfield in Herefordshire on 9 January 1834 and educated at Downside in Somerset, was admitted to the Benedictine order on 12 September 1853 and ordained priest in

1859. For two years he worked in the mission attached to Downside, and for 12 years more was stationed at Belmont near Hereford, as professor of metaphysics in 1861-2 and as prior from 1862 to 1873. During this period of his life he made the elaborate studies which resulted in his *Life of St. Thomas of Aquin*, published in 1871-2, a book both erudite and fascinating which gave its author definite literary rank. Archbishop Polding, who had met him during a visit to England in 1865, was extremely anxious to have him as coadjutor; and after long delays he was on 19 March 1873 consecrated archbishop of Nazianzus *i.p.i.* and appointed coadjutor to Archbishop Polding, with the right of succeeding him. Keenly interested in education, he resolved almost immediately after his arrival in Sydney to identify himself as fully as possible with the Catholic college of St. John within the local university; he therefore, from 1874 to 1878 undertook the rectorship of the college, and lived in it until he left Australia.

At Archbishop Polding's death in 1877 Dr. Vaughan became archbishop, and was invested with the pallium in St. Mary's cathedral on 13 January 1878. Almost at once he was thrust into a bitter quarrel with the colonial government over the education bill brought in by Sir Henry Parkes, under which all state aid to denominational schools was to cease at the end of 1882. Failing to defeat this measure—which became law in 1880—Dr. Vaughan devoted all the more care to developing his own church schools, and in 1883 was able to show that in the ten years of his administration the number of these schools had trebled and 12,500 children were being taught in them. When he first reached Sydney there were in the diocese 53 churches (or buildings serving as churches) and 34 schools; in 1883, when he left the colony, there were 120 churches and 102 schools, most of them staffed from religious communities. He also devoted much energy and ability to the rebuilding of St. Mary's cathedral at Sydney, which had been destroyed by fire in 1865. Large contributions were obtained by his personal appeals—he once mentioned that in a little over 12 months he had written with his own hand 2446 such appeals. In April 1883 he returned to Europe to secure new teachers for his schools, reached England on 16 August, and on the morning of the 18th was found dead in bed at Ince Blundell Hall in Lancashire, where he was participating in a family reunion. His body was entombed in St. Michael's abbey at Belmont, where he had been cathedral prior before coming to Sydney.

Vaughan was an eloquent preacher, and attracted to the Sydney pro-cathedral probably the most highly educated and influential congregation it ever held. Besides his *Life of St. Thomas of Aquin* already mentioned he published several volumes of lectures, pastorals and speeches, the greater number dealing with education and its relation to religion. No biography of him has been published. For his early life Snead-Cox's *Life* of his brother, Cardinal Vaughan, is useful; see also Dom Birt's *Benedictine Pioneers in Australia* and a memoir in the *Downside Review* for January 1884.

E.M.O'B.

Vaux, James Hardy, first appears in credible history when in 1801 he was transported to Australia for stealing a handkerchief worth 11d. (if the value had been set at a penny more, he could have been hanged). In 1819 was published his autobiography, and from it we may draw an interesting, if not wholly reliable, account of his early years. Born at East Clandon in Surrey on 20 May 1782, eldest son of a man who left a good position as butler to become first a hatter and hosier and then a tallow-chandler, Vaux at the age of 12 knew the *Stud Book* by heart, and had ambition for fame as an actor. At 14 he took up cock-fighting, and embezzled to pay his gambling losses. At 15 he tried landlord-bilking and obtaining goods under false pretences. Within the next two years he was successively a paymaster's clerk in the navy, a billiard-sharper, and an engrosser for a country conveyancer; then he abandoned honest work altogether, went back to London with a trunkful of the conveyancer's property and someone else's gold watch, and joined a gang of pickpockets. Then, as has already been said, he stole a handkerchief and was sent to Australia. He was tried out as clerk to the storekeeper at the Hawkesbury, acted as tutor to the family of the resident magistrate, was brought back as a favour to the commissary's office in Sydney, and at once began to forge the governor's initials to orders for goods which he sold to local shopkeepers. He was found out and sent to the road-gang, but curried favour with Samuel Marsden and was given the billet of magistrate's clerk at Parramatta. When King and Marsden went to England in 1807, Vaux was taken along to act as King's unofficial private secretary, but during the voyage was dismissed and entered on the ship's books as a common sailor. On reaching England he deserted, and reverted to pickpocketing and similar crimes (but was scrupulous about paying his rent and his tradesmen); at the end of 1808 he robbed a jeweller, pawned the spoil, was caught, convicted, condemned to be hanged, respited, confined for a year in the hulks, and on 16 December 1810 found himself back in Port Jackson with a life sentence.

Macquarie, now governor, was lenient to first offenders and gracious to emancipists who had justified their freedom by good behaviour; to re-convicted criminals he was inexorably stern. Vaux was assigned to a Hawkesbury settler (John Benn), shammed sickness to escape, joined in a conspiracy to rob Ellis Bent, and was sent to the Newcastle coal-mines. Returning to Sydney in January 1814 he stowed away on an outgoing East Indiaman, was caught, flogged, and sent back to the mines. There he was made clerk to the commandant, compiled his autobiography (with a *Vocabulary of the Flash Language, or Thieves' Dialect* as appendix) and attracted the attention of Barron Field (q.v.), who in 1819 took the MS. to London and had it published. Some time afterwards Vaux obtained a conditional pardon and was made clerk in the colonial secretary's office at Sydney, but at the end of 1826 was dismissed by Darling on the ground that a twice-transported man did not deserve to be a government official. He appealed to the press against this dismissal, and the anti-Darling *Monitor* supported him—which of course did him no good in official quarters. In June 1829 he absconded from the colony (thus violating a condition of his pardon and reviving his life-sentence), went to Dublin under an assumed name, was there convicted of larceny and given seven years, and in the early thirties for the third time reached Port Jackson aboard a convict transport. Roger Therry saw him there, thought him very like portraits of Robespierre, and heard him pour forth vows of contrition in

'silvery accents:' within 12 months he was convicted of some felony, and sent for two years to a road-gang.

When he died we know not. In 1845 Hartley Coleridge referred to him as having 'turned preacher in Australia'—an episode of which there is no other record. Roger Therry wrote that about 1852-3 he saw Vaux, 'then advanced into the decrepitude of age,' in the dock accused of a fresh crime. In 1867 Walter Thornbury suggested to Charles Dickens a series of articles for *All The Year Round* which should include biographies of Vaux and Barrington, but Dickens struck out Vaux as a 'rascal' whose proceedings were 'unwholesome.'

Vegetable Products, CHEMISTRY OF. In this article no attempt has been made to give a complete survey of the chemical products of Australian vegetation.

The *carbohydrates* occurring naturally in plants include sugar, starches, celluloses, and allied substances. The classification generally adopted divides the group broadly into sugars and non-sugars, and then subdivides the latter section. Sugars include the mono-saccharoses, $C_6 H_{12} O_6$ (glucose, etc.); the di-saccharoses, $C_{12} H_{22} O_{11}$ (cane-sugar, etc.); and the tri-saccharose, $C_{18} H_{32} O_{16}$ (raffinose). Non-sugars are polysaccharose $(C_6 H_{10} O_5)_n$, and include starch, gum, cellulose, etc. Although the sugars are distributed throughout the indigenous vegetation of Australia, they are of little importance economically. The most interesting of the group is, perhaps, *raffinose*, the chief constituent of the manna, which exudes from the bark of such species as *Eucalyptus punctata*, and is found on the leaves of *E. viminalis* and allied species when they are gnawed by beetles or otherwise injured. By careful hydrolysis raffinose can be broken down into three sugars, dextrose, levulose, and galactose. Substances belonging to the polysaccharose group are much more abundant in Australian vegetation. *Starch* occurs in various parts of plants, more particularly in the fruits and tubers, where it is stored as reserve material for subsequent use. In Australia it forms a large proportion of the fruits of certain plants, such as those of the Burrawang (*Macrozamia spiralis*), Bunya-bunya (*Araucaria Bidwilli*), Nut Palm (*Cycas media*), and Moreton Bay Chestnut (*Castanospermum australe*). These fruits were used extensively as food by the aborigines; to neutralize certain poisonous contents they were pounded, soaked in running water for some time, and afterwards roasted. Numerous starch-containing roots were also used by the aborigines. The white settlers soon improved on the crude native methods, and an excellent starch, much resembling that of arrowroot, was prepared from the fruits of the burrawang. The root-masses of this plant, which often attain great size, contain an abundance of starch, and efforts have been made to prepare an edible starch from them on a commercial scale. Species of *Macrozamia* are extensively distributed in many parts of Australia, and should some day be utilized for the production of starch and its derivative glucose.

The *gums* are semi-transparent, amorphous substances exuded from numerous trees and shrubs. The better kinds dissolve completely in water, but are precipitated again by alcohol; the less soluble, although chemically allied, swell up in water, but do not wholly dissolve; some scarcely dissolve at all. The best-known of the Australian gums are derived from the several species of *Acacia*, but differ much in solubility and other general characters. As a rule gums from the inland species (*A. sentis, A. homalophylla, A. leiophylla*, etc.) strongly resemble the gum arabic of commerce in appearance, solubility, and composition. Gums derived from species common to the coastal districts, such as the various forms of *Acacia decurrens*, are darker-coloured and less soluble. This condition may possibly be due to climatic influence including the increased rainfall. Some Australian acacias, however, (e.g. *A. microbotrya* of Western Australia, and *A. pendula* of New South Wales and Queensland), yield considerable quantities of gum of very good quality, and it should be profitable to collect this systematically. Gum from the Leopard Tree (*Flindersia maculosa*) is also of good quality, and is often found on the trees in masses of considerable size. These gums are all allied chemically to gum arabic, and consist principally of the calcium, magnesium, and potassium salts of arabic acid. When hydrolysed by boiling with sulphuric acid, they yield the sugar arabinose $C_5 H_{10} O_5$; when oxidized by the aid of nitric acid, many yield mucic, saccharic, and finally oxalic acid as the chief products. The acacia gums were favourite articles of food with the aborigines, though their food-value is but small, and animals fed entirely upon it do not long survive. The various species of *Sterculia* yield gums which have a paraffinoid lustre, are tough and horny, break with a dull fracture, and much resemble the gum tragacanth of commerce. *Sterculia* gum swells to a considerable extent in cold water, but dissolves only slightly; under chemical treatment it differs from tragacanth in many respects. Although often occurring in considerable quantities (on *S. diversifolia* particularly), economic uses have not yet been found for it.

Cellulose is more extensively distributed than any other member of the carbohydrate group; it forms the basis of most plants, and is the chief constituent of the timber of even the largest trees. The empirical formula for cellulose is generally stated as $(C_6 H_{10} O_5)_n$, since the molecular weight is not known with certainty, but must be very considerable. Cotton may be taken as the highest type of cellulose in the purest natural form, and, together with flax, hemp, jute, etc., is cultivated principally for employment in the textile industries. Cellulose also forms the raw material of paper, gun-cotton, artificial silk, celluloid, and numerous other products. In timber, cereal straw, grasses, etc., it is combined with non-cellulose constituents of the nature of lignin, and for this reason the name 'lignocellulose' is sometimes given to this group. In the manufacture of pulps for paper-production, the material that cements the wood-fibres together is removed by chemical means; the cellulose left behind consists of short fibres of varying lengths and thickness, and these readily felt together to form paper. During recent years the production of paper-pulp has become an industry of considerable magnitude, but little has been done in Australia. It has been manufactured in Queensland from the waste timber of *Araucaria Cunninghami*, as well as from other material, but the amount so produced has been small; yet there are in the forests of eastern Australia large supplies of suitable eucalypt timber, in close proximity to ample supplies of water for the production of

power and for manufacturing purposes. Eucalypt timbers suitable for paper-pulp production are the longer-fibred species, such as *E. Delegatensis, E. Dalrympleana,* and *E. oreades* (*E. altior,* Maiden). The ultimate fibres from these and allied species are thin-walled and flexible, and measure up to 1.5 mm. in length and from 0.015 to 0.03 mm. in width; the yield of cellulose from the timber of species belonging to this group is from 50 to 55 per cent. Probably no better hardwoods are available anywhere for paper-pulp production than the members of the 'ash' group of eucalypts. The wood-fibres (tracheids) of *Araucaria Cunninghami* are particularly suitable, as they measure up to 9 mm. in length with a diameter of about 0.09 mm. Several of the scrub timbers common to northern New South Wales and Queensland also produce excellent wood-fibre, but it is not known as yet whether they are sufficiently gregarious to warrant exploitation. Another source of cellulose is the 'marine fibre' (q.v.) derived from *Posidonia australis,* of which there are enormous deposits in Spencer Gulf; the separated 'wood-fibres' produced from this make excellent paper. The cellulose is readily separated from the incrusting material by the action of chlorine. Marine fibre may eventually be utilized also for textile purposes, as means have been devised for removing the brittleness of the untreated fibre.

The *essential oils* are a class of odoriferous bodies found in plants, which differ in many respects from the fixed oils; they are also known as 'volatile' and as 'ethereal' oils. They are in most cases volatile without decomposition, and may therefore be obtained by distillation. They are usually lighter than water, and when placed on paper do not leave a permanent oily stain. These essential oils give plants their peculiar fragrance. Their distribution is not restricted to any particular portion of a plant; they may be present in flower, leaf, bark, or timber. During recent years much work has been undertaken in determining the chemistry and general characteristics of these oils and their constituents, but the part they play in the economy of the plant remains undecided. For the most part they consist of hydrocarbons and oxygenated compounds. They are classified according to constitution and chemical reactions into terpenes, alcohols, aldehydes, ketones, esters, phenols, acids, etc.; members of these groups are found in essential oils all the world over, the differences in molecular arrangement and physical characters separating the individual members one from the other. Plants producing essential oils are abundant in Australia. Among the Myrtaceae *Eucalyptus* naturally takes first place; the essential oils derived from 180 distinct species have been investigated, and their constituents determined and classified on a phyto-chemical basis, the botanical study being concurrent with the chemical. The character of the venation of the mature lanceolate leaves has been shown to indicate the chief oil-constituent characteristic of the group. Eucalypt-leaf venations may be divided into three chief groups. In the first are leaves having a feather-like venation, with thick mid-rib and marginal vein close to edge of leaf. This group is representative of the earliest members of the genus, and indicates that the chief terpene is pinene, while phellandrene is absent. The very young leaves of most of the members of this group are coated with rubber. The leaves of the second group have a more open venation, the more pronounced veins lying more acutely to the mid-rib than in the first group, and the marginal vein being farther removed from the edge. This venation suggests that the chief constituent in the oil is cineol or eucalyptol. In the third type of venation, which represents more recent species, the veins are very acute to the mid-rib, with the marginal one far removed from the edge; in some cases there is a second marginal vein. This venation indicates that one of the oil-constituents is the terpene phellandrene. Eucalypt oils for commercial purposes are distilled from species of the second and third groups, as the yield of oil from the first group is too small, and its constituents in most cases are of insufficient value for profitable distillation. Pharmaceutical eucalypt oils, employed for medicinal purposes, are mostly distilled from members of the second group, cineol being the constituent demanded. Oils from the third group are utilized chiefly for mineral flotation-work in the separation of metallic sulphides from the gangue, for disinfectants, and for other industrial purposes; the yield of oil from these species is often considerable, and the product is consequently inexpensive. Members of this group also contain the important ketone piperitone, which often constitutes over 40 per cent of the oil of *E. dives.* Piperitone is of great economic importance, in that by suitable oxidation the phenol thymol is produced, and by reduction both menthone and menthol are formed.

Although about 40 distinct chemical constituents have been isolated from eucalypt oils, piperitone is the only ketone. No fewer than 11 alcohols have been determined, including geraniol, terpineol, piperitol, eudesmol, etc.; nine aldehydes, including cuminal, aromadendral, cryptal, citral, citronellal, etc.; two phenols, tasmanol and australol; seven esters, including geranyl-acetate, terpinyl-acetate, butyl-butyrate, etc.; five terpenes, pinene, phellandrene, limonene, dipentene, and terpinene; one sesquiterpene (aromadendrene), a solid paraffin, cymene and cineol. Several of these constituents are valuable for perfumery, and occur in maximum amount in isolated species, the same species giving the same chemical products wherever it grows naturally. The best species for procuring geranyl-acetate is *E. Macarthuri,* in which it occurs in both leaves and bark; for citral, *E. Staigeriana*; for citronellal, *E. citriodora*; for cineol, *E. polybractea* (*E. fruticetorum,* Maiden), *E. Australiana* (*E. radiata,* Maiden), *E. Smithi,* etc.; and for piperitone, *E. dives.*

Other myrtaceous genera (*Melaleuca, Leptospermum, Backhousia, Darwinia,* etc.) also include species yielding essential oils suitable for perfumery and other industrial purposes, or for the manufacture of compounds of greater value than the original substance.

Various species of Coniferae also yield oils that show considerable differences in constitution, and in some cases contain constituents quite unique for this order. The leaf-oils of what appear to be the older members of the genus *Callitris* (those growing in Western Australia) contain the ester bornyl-acetate in addition to terpenes; this ester is characteristic of the pine-needle oils produced in other countries, where they are employed to give an odour of pine to soaps and sprays. The oil of the New South Wales species, *C. glauca,* would be quite suitable for this purpose. As the genus evolved, this ester was slowly replaced by geranyl-acetate, until in species growing on the extreme eastern

verge of Australia it has entirely disappeared; the oil of the Tasmanian Oyster Bay Pine (*Callitris Tasmanica*) contains over 60 per cent of geranyl-acetate, and no bornyl-acetate at all.

The characteristic odour of cypress pine timber is due to a phenol named callitrol, which probably causes the darkness of the timber and also its resistance to the ravages of white ants.

The sweet odour of the timber of Huon Pine (*Dacrydium Franklini*) is due to the somewhat rare constituent methyl-eugenol, which also occurs in quantity in the leaf-oil of *Melaleuca bracteata*. Among other peculiar characteristics of the essential oils of Australian Coniferae are the presence of the fully saturated hydrocarbon C_{10} H_{20} in the oil of the latex of *Araucaria Cunninghami*; the occurrence of a crystallized substance (guaiol) in *Callitris* timber; the presence of a crystallized substance with the formula C_{20} H_{32} in the leaf-oil of *Phyllocladus rhomboidalis*; and the presence of a highly dextro-rotatory limonene in the oil of *Athrotaxis selaginioides*.

The essential oils of the Rutaceae and Labiatae have not yet been systematically investigated, though the products of isolated species (such as *Boronia*) have been determined. Camphor from *Cinnamomum Oliveri*, and sandalwood oil from *Fusanus spicatus*, may also be mentioned in this connection. But enough has been said to show how exceedingly rich Australia is in oil-producing plants, and how important an industry may be built up, under scientific control, in perfumery.

The essential and the *fixed oils* differ considerably in constitution and chemical character. The latter are generally compounds of glycerol (a tri-hydric alcohol) with organic acids such as oleic, palmitic, and stearic acid. Their classification is based upon the acid they contain; for instance, the term 'tri-olein' means that each hydrogen atom of the three hydroxyl groups in glycerol is replaced in the molecule by the oleic acid radicle. If the replacing radicle is that of stearic acid, the oil or fat is known as tri-stearin, and so on. Most fixed oils, however, are mixtures of various compounds. Oleic acid belongs to the unsaturated group of acids, and —principally for this reason—oils containing tri-olein in excess are liquid at ordinary temperatures; stearic and palmitic acids are members of the fatty acid series, and fully saturated, and—chiefly on this account, and because of the high molecular weight of these acids—the resulting products are solid at ordinary temperatures. Vegetable fixed oils occur abundantly in the seeds of most plants, and for industrial purposes are usually extracted by hydraulic pressure. Oils of linseed, cotton-seed, coconut, and many others are so prepared for manufactures or for food.

The indigenous flora of Australia is not rich in plants suitable for the production of fixed oils, though a few might be so utilized if the supply of them was abundant. The Queensland Nut (*Macadamia ternifolia*) contains an abundance of fixed oil, consisting very largely of tri-olein. The Candle-nut (*Aleurites moluccana*) is also exceedingly rich in oil, as are the kernels of the Quandong (*Fusanus acuminatus*) and of the Grease-nut (*Hernandia bivalvis*). The Coconut Palm (*Cocos nucifera*), which is such a valuable asset to the islands of the Pacific, may be included, though some botanists doubt whether it is truly indigenous. The seeds of many smaller plants contain fixed oils, but do not appear promising from an economic standpoint; much chemical work remains to be done before their yield and general characteristics can be stated.

Resins usually occur as amorphous, brittle masses, insoluble in water and dilute acids, but soluble in alcohol, ether, and turpentine; they are often associated with essential oils, and in some instances are certainly polymerized constituents of these oils. Sunlight seems to be detrimental to this polymerization, as it takes place more readily in the dark. This fact has been demonstrated with the leaf-oils of the Australian *Callitris*, where oils placed in full light in a show-case have shown no formation of resin after about 15 years, whereas the remainder of some of the same oils placed in a dark cupboard has largely changed to resin. Australia is not rich in resin-producing plants suitable for industrial purposes, probably because certain coniferous genera common to other parts of the world, from which the resins of commerce are obtained (e.g. *Pinus*), do not occur in Australia. Our most characteristic coniferous trees belong to the genus *Callitris*, the species of which produce a resin in tears on the outside of the tree, known in commerce as sandarac. Australian resin is quite equal in quality to the sandarac of north-western Africa, and may be employed for similar purposes. Some years back considerable quantities were collected and exported, but unfortunately means have not yet been devised to induce a larger flow of resin, and the individual tears are somewhat costly to collect; the difficulty appears to follow from the absence of resin-canals in the bark. The best sandarac-producing species are *Callitris glauca* and *C. calcarata*; the tears from these are usually larger than are those of the African resin. Sandarac from *C. arenosa* much more closely resembles the African product.

Much chemical work has been undertaken to determine the composition of sandarac, but the results obtained by different workers do not always agree, and the resins from different species differ in several respects. For instance, Australian sandarac resins being all optically active, their mean specific rotations from various species vary as follows:—*C. calcarata*, + 30.08°; *C. glauca*, + 36.5°; *C. arenosa*, + 38.8°; whereas the African sandarac gave a corresponding rotation of only 27.6°. It may be accepted, however, that the chief constituents of sandarac resin are acid resins with somewhat high molecular weights; one of these forms a potassium salt insoluble in excess of alcoholic potash; another is soluble under this condition.

The resinous exudation of *Araucaria Cunninghami* contains, in addition to the resin, a gum very similar in constitution to gum arabic. The resin is composed of two resin acids, besides neutral bodies; one of these—Dundathic acid—is dextro-rotatory, and has the formula C_{21} H_{32} O_5; the other (which occurs in much greater proportion) is lævo-rotatory, and has the formula C_{20} H_{30} O_2. The exudation of *A. Bidwilli* consists almost entirely of gum. The Queensland Kauri (*Agathis robusta*) produces an oleo-resinous exudation from which a commercial oil of turpentine might be prepared, as the terpene is pinene and the yield about 14 per cent. The remaining resin is of inferior quality to that of *Araucaria Cunninghami*, although one of the acids is Dundathic acid; the other, which forms the greater portion of the resin, is also dextro-rotatory, and has the formula C_{19} H_{28} O_4.

Fossil resins corresponding to the kauri resin of New Zealand have not been found to any

extent in Australia. A few other Australian plants give resinous exudations, but these, with the exception of the grass-tree, are of little economic value, though of scientific interest. Among them are *Baveria viscosa, Phebalium glandulosum, Triodia irritans, Melaleuca uncinata,* and *Syncarpia laurifolia.*

Grass-tree resin, known as 'gum acaroides,' is particularly an Australian commodity, and at one time was exported to Europe in some quantity. Before 1914 South Australia exported about 1000 tons per annum, of an average value of about £5 10s. per ton. This is one of the red resins, the product of *Xanthorrhoea Tateana,* and is collected chiefly on Kangaroo Island. The yellow resin, the product of *X. hastilis,* was exported from New South Wales to the extent of about 200 tons per annum; it is of much greater value than the red resins derived from most of the species, particularly from *X. Preissi* of Western Australia and *X. arborea* and *X. australis* of eastern Australia and Tasmania. Of the 14 varieties of grass-tree found in Australia only a few can be profitably worked for resin, as the uses to which it can be put are limited; it is principally employed in the preparation of spirit lacquers for metals, for cheap varnishes, and similar productions, and in paper manufacture. By suitable treatment with nitric acid it forms picric acid or trinitrophenol; but the most that can be produced in this way is 50 per cent of the weight of the resin, and ordinary phenol from coal-tar produces more than three times that amount. Considerable work has been undertaken on the chemistry of grass-tree resins; but the results do not always agree, and it is evident that a correct knowledge of their composition as a group can hardly be obtained until a systematic phytochemical research is undertaken.

Vegetable *tannins* are mostly uncrystallizable substances, colloidal in character, and having astringent properties. They are not, as a rule, restricted to any part of the plant, but in Australia particularly they are mostly distributed in the bark. They vary much in chemical composition, and consequently show great differences in chemical reactions. They are of great economic importance, being important agents in the manufacture of leather.

The bases of the tannins are phenolic in character; around their nuclei the more complex tannins are built up—so complex that our knowledge of their structure is, as yet, most incomplete. Tannins formed on a di-hydric phenolic nucleus, such as catechol or resorcinol, differ considerably in general character from those built upon a tri-hydric phenolic nucleus, such as pyrogallol or phloroglucinol. The pyrogallol tannins found in plants of other countries do not occur in Australia to any extent, and have to be imported; such are myrobalans, valonia, oakgalls, sumach, etc. The pyrocatechol tannins, however, occur here abundantly in some species of *Acacia, Callitris, Eucalyptus,* and the mangroves, and often form a large proportion of the barks of these trees. Members of the pyrogallol group give a blue colour with ferric salts, and produce a bloom on the leather. Pyrocatechol tannins, on the other hand, give a greenish colour with ferric salts, do not deposit a bloom on the leather, and when boiled with acids form red insoluble substances known as phlobaphenes. Under natural conditions they have a tendency to form similar compounds, and for this reason redden leather that is tanned with them. Tannins characteristic of some species of *Eucalyptus* are derivatives of resorcinol or phloroglucinol, but their structure has not been definitely determined.

Of the many hundred Australian species of *Acacia* comparatively few produce barks suitable for the tanner. *Acacia pycnantha,* the Golden Wattle of South Australia, produces probably the best and richest of all pyrocatechol tannins, the average amount of tannin ranging between 30 and 40 per cent in air-dried bark. The Feathery-leaved Wattles (*A. decurrens* and *A. mollissima*), together with the closely related varietal forms *pauciglandulosa* and *Leichhardti,* rank next in value. The best of this group is *A. mollissima,* the Green Wattle of south-eastern Australia and Tasmania, which produces a bark little inferior to that of *A. pycnantha,* with 30 to 35 per cent of tannin in air-dried bark. The forms of the *A. decurrens* group might probably, under suitable conditions, prove almost of equal value. The species mentioned above are, of course, also artificially cultivated—somewhat spasmodically in Australia, more systematically in South Africa; but several other species of *Acacia* are worth considering as tannin-producers, particularly for the manufacture of tanning extracts. Some (e.g. *A. penninervis, A. binervata,* and *A. salicina*) grow to a considerable size, and produce much bark. It is regrettable that so little effort has been made to produce tanning substances in sufficient quantity for export, in place of importing them. Nearly the whole of the imported bark comes from South Africa, and is the produce of the introduced Australian wattle *Acacia mollissima.* In New South Wales considerable areas are covered with Black Pine (*Callitris calcarata*), whose bark contains a considerable quantity of an excellent catechol tannin, the average amount from old trees ranging from 20 to 25 per cent, that from younger trees is larger; a sample from a tree about five inches in diameter gave on analysis 31 per cent of tannin. This species grows most abundantly in mountainous country, of little value for agricultural purposes, so that its exploitation would give a clear profit. In chemical composition this tannin is practically identical with that of the valuable 'hemlock bark' of America, but *Callitris* bark is twice as rich in tannin content.

Of eucalypt barks suitable for tanning the best is the Western Australian *E. occidentalis,* known as mallet wood. The tannin of this tree belongs to the pyrocatechol group, and its kino contains the crystalline body eudesmin, also a catechol derivative. In eastern Australia the barks of the ironbark group often contain considerable quantities of an astringent substance which differs in constitution from that of *E. occidentalis.* Both *E. crebra* and *E. sideroxylon* contain much kino distributed through their barks; efforts have frequently been made to utilize this material, but its action on hide substance is indifferent, and it is chemically inferior for tanning purposes. Eucalypt barks whose kinos contain eudesmin may be satisfactorily employed for tanning purposes—provided, of course, that they contain a sufficient amount of tannin. During recent years, too, the barks of certain mangroves have been so employed, and some of them contain a considerable amount of tannin; the best of these is perhaps the Red Mangrove (*Bruguiera Rheedii*). Other Australian plants have been employed in a small way for tanning purposes, but are of little commercial importance.

Kino is probably a word of West African

origin, applied to the astringent exudations of certain trees. In Australia exudations of the eucalypts and *Angophora* represent this class, though often called gums; but the substance technically known as gum does not occur in any of the eucalypts. Kino is employed in medicine as an astringent, and eucalypt exudations were similarly used in the very early days of the colony (see White's *Journal of a Voyage to New South Wales*, published in 1790). Correct knowledge of their constitution was, however, lacking, and certain defects brought the Australian product (Botany Bay kino) into disfavour with pharmacists. It is now known, however, that certain Australian kinos are superior to either the Indian or the African kinos, and a tincture made in 1896, according to official directions, from the kino of *E. calophylla* is now as fluid as when first prepared.

Eucalypt kinos may be divided into four groups:—(*a*) Kinos exuded by the earlier members of the genus in the sequence of evolution; these, in addition to a tannin, contain the crystallized body aromadendrin; they do not readily gelatinize, and some of them make excellent tinctures. (*b*) Kinos containing the crystalline substance eudesmin, in addition to aromadendrin; these are obtained from the gums, boxes, and allied species. (*c*) Kinos containing neither eudesmin nor aromadendrin, but consisting largely of the glucoside emphloin, which is soluble in water but insoluble in alcohol, and for this reason was long considered to be a gum; the ironbarks and a few other species produce kinos belonging to this group. (*d*) Kinos containing none of the foregoing substances, very astringent, but gelatinizing rapidly in tinctures. Peppermint, stringy-bark, blackbutt, and ash kinos belong to this group. The kinos of *Angophora* are mostly in chemical agreement with the first group. *Aromadendrin* (formula probably C_{15} H_{10} O_5) yields phloroglucinol on fusion with alkalis, and picric acid on boiling with nitric acid; it contains no methoxy group, and is optically inactive. Eudesmin (formula C_{22} H_{26} O_6) is laevo-rotatory, contains four methoxy groups, crystallizes beautifully, and is a very reactive substance. The tannins of the group containing eudesmin are catechol tannins, and eudesmin itself is a catechol derivative. On the other hand eucalypt kinos not containing eudesmin or aromadendrin are resorcinol or phloroglucinol derivatives, so that a somewhat close connection may be traced between the chemistry of eucalypt exudations and that of their oils.

The vegetable *dyes* produced by Australian plants are, economically, of only moderate value, and of those so far investigated only a few show industrial promise. The rapid advance in the production of synthetic dye-materials made during recent years also minimizes the usefulness of natural vegetable dyes, though for fastness when exposed to light or boiled with soap some of the Australian products stand high. For bright tints and gay colours the synthetic dyes have no competitor, but for more sombre tints and browns and yellows some Australian dyes are quite suitable. One of the most abundant and easily procured dye-substances is myrticolorin, obtained from the leaves of certain eucalypts, particularly *E. macrorrhyncha*; no less than 8½ lb. of dry myrticolorin can be obtained from 100 lb. of the leaves and terminal branchlets. The dry leaves are ground to a very fine powder, which is boiled in water, and the liquid filtered while boiling hot; as the solution cools the dye-material crystallizes out, being almost insoluble in cold water; it is then filtered again, washed in cold water and dried. Myrticolorin is a glucoside of quercetin, and has the formula C_{27} H_{30} O_{16}; on hydrolysis it takes up three molecules of water to form glucose (C_6 H_{12} O_6), rhamnose (C_6 H_{14} O_5), and quercetin (C_{15} H_{10} O_7). It is a mordant dye, and gives to cotton cloth mordanted with aluminium a bright yellow colour; with tin, a primrose; with chromium, a khaki, and with iron, an olive-black. The wood of *Rhus rhodanthema* contains the dye-material fisetin, and is thus closely allied to the wood of the 'young fustic' of commerce, still used for producing certain colours on mordanted cloth. The tannins may also be employed for dyeing, and some eucalypt kinos produce very fast colours (shades of gray and brown to brownish-black) on mordanted cloth. Specimens of calico dyed with eucalypt kinos have been hanging in daylight for 25 years, and are now as bright as when first produced. Scores of Australian plants contain substances which have dyeing properties, or constituents which might be made into those substances, but they are mostly only of scientific interest.

That certain Australian trees and shrubs contain bitter principles has long been known; the barks of sassafrases (*Atherosperma moschata* and *Doryphora sassafras* in particular) have been employed as a tonic medicine, as well as the whole plant of the little pink-flowered Native Centaury (*Erythrea australis*). A considerable amount of investigatory work has been undertaken on plants which show a pronounced indication of the presence of alkaloidal substances, among them Fever Bark (*Alstonia constricta*), Pituri (*Duboisia Hopwoodi*), Corkwood (*Duboisia myoporoides*), Asthma Herb (*Euphorbia pilulifera*), and Sarsaparilla (*Smilax glycyphylla*). Numerous other Australian plants have, at one time or another, been mentioned as containing possible medicinal substances.

In the barks of some Australian trees oxalic acid is secreted in considerable quantities, particularly in those of *Eucalyptus salubris, E. gracilis, E. Behriana*, and *Acacia Cambagei*; in some instances more than one-sixth of the entire dry bark consists of oxalate of lime. A secretion is found occasionally in the timber of the Silky Oak (*Orites excelsa*), which consists essentially of succinate of aluminium; both the acid and base of this substance are very rare in flowering plants, so that the deposit is almost unique. A secretion is also found in the timber of the Colonial Beech (*Gmelina Leichhardti*). This substance (known as gmelinol) is an alcohol (formula C_{13} H_{14} O_4), crystallizes well, and is often distributed through the timber in the form of white specks—which are not, as has been supposed, signs of decay. Mannitol (C_6 H_{14} O_6), one of the polyhydric alcohols, is not an uncommon substance in Australian plants; the globular masses found on Blue Grass (*Andropogon annulatus*) consist very largely of mannitol, as does also the exudation of *Myroporum platycarpum*. Vegetable wax, closely approaching Carnaübra wax both in hardness and in melting-point, occurs in some quantity as a coating on the stems of Cane Grass (*Glyceria ramigera*). The glaucous appearance on the leaves of certain eucalypts (*E. cinerea* and *E. pulverulenta* in particular) is almost entirely due to the presence of a vegetable wax, but this is of low melting-point and has no economic

value. Rubber has been isolated from the latex of *Alstonia scholaris*, and a few other plants, but only in comparatively small amounts. The bark of Coachwood (*Ceratopetalum apetalum*), contains coumarin, the sweet-smelling constituent of new mown hay. H.G.S.

Velleia, a genus of the family Goodeniaceae, consisting of herbs with a thick rootstock. Nineteen species are endemic in Australia. The flowers are yellow, on twice or thrice branched flower-stems, subtended by leafy bracts; calyx 3-5 segments; corolla oblique, with a hollow protuberance at the base, the two upper lobes usually unequally winged. In *V. perfoliata* the bracts are large, and cohere by their stem-clasping bases. In *V. paradoxa* the hollow protuberance of the corolla is produced into a spur. *V. lyrata* has a tuft of dissected, lyre-shaped, basal leaves. *V. montana* is limited to alpine or sub-alpine stations.

Ventilago, a widespread tropical genus of the family Rhamnaceae; two species are endemic in Australia. *V. viminalis* (Supplejack), is a dry-country plant, extending from South Australia to Queensland; it is a small bushy tree of 20-30 feet, with sprays of insignificant

Supplejack (*V. viminalis*).

petal-less flowers, and fruits with a long narrowing wing. It is known to the aborigines of northern New South Wales as 'cunnyannah' and to the Cloncurry natives as 'thandorah.' The trees have the habit of suckering, and a small clump may arise from a common rootstock; the young shoots form a thin slender stem, and frequently seek the support of older trees, upon which the supple branches climb. The supplejack is a most valuable fodder-tree, and will bear severe lopping, the operation accentuating the growth of suckers. The wood is pithy, and is often used by the aborigines to produce fire.

Verbena, a genus of the family Verbenaceae, comprising a large number of species, chiefly South American; among these are the garden verbenas, as well as several species which have become naturalized in Australia and are regarded as weeds (see NOXIOUS PLANTS). The only species indigenous to Australia, *V. officinalis* (the Vervain of Britain), was formerly used as a medicinal herb.

Verbenaceae, a family of herbs, shrubs, trees, or woody climbers, with opposite or whorled (rarely alternate) leaves, of ubiquitous range, but most abundant in the tropics. Of the 20 genera indigenous to Australia, 5 are numerously represented in tropical Asia and Africa, and 3 are chiefly American. With the exception of *Faradaya*, which is also found in certain South Pacific islands, the remaining genera are endemic. The calyx is persistent, truncate, toothed, or lobed; corolla with 4-5 (rarely 6-8) lobes, more or less two-lipped, and imbricate in bud; stamens inserted in the corolla-tube, usually in two pairs; fruit dry or succulent, usually separating into 2-4 nuts. *Newcastlia* is endemic in south-western Australia; it consists of shrubs with opposite undivided leaves and stalkless flowers in dense terminal woolly spikes. The family includes the mangroves (q.v.).

See CALLICARPA, CHLOANTHES, CLERODENDRON, CYANOSTEGIA, GMELINA, LACHNOSTACHYS, PREMNA, SPARTOTHAMNUS, VERBENA, and VITEX. Nearly all are worth cultivating, for their beauty or for their bizarre appearance.

Verdon, SIR GEORGE FREDERICK (1834-1896), born at Pendleton in Lancashire on 21 January 1834 and educated at Rossall School, migrated to Victoria in 1851 to work on the goldfields, but after an unsuccessful venture near Castlemaine entered the service of Messrs. Heape and Grice. He joined the volunteer force in 1854 (captain, 1857; major, 1863), became a member of the Williamstown council in 1856, acted as honorary assistant in the Melbourne observatory in 1858, and entered politics as member for Williamstown in 1859 to become treasurer in the Heales ministry of 1860-1—no bad record for a young man of 26. He was called to the Victorian bar in 1863. Although it was an adverse vote on his budget that destroyed the Heales ministry, he was again made treasurer by McCulloch in the ministry of 1863-8. In 1866 he was sent to London to negotiate the raising of a loan, the establishment of a branch mint in Melbourne, and the strengthening of the colony's defences; in all he was successful, and the addition of the *Nelson* and the *Cerberus* to the Victorian naval forces was mainly his work. From 1868 to 1872 he was agent-general in London, resigning to become general manager of the English, Scottish and Australian Bank in Melbourne; he retired in 1891 and died in London on 13 September 1896.

Apart from commercial and political affairs Verdon's chief interest centred on art. In 1864 he served on a fine arts commission, and thenceforward assisted the trustees of the national gallery assiduously; in 1872 he himself became a trustee, and was president from 1883 to 1896. In 1870 he was made a fellow of the Royal Society. In 1858 he published a pamphlet on *The Present and Future of Municipal Government in Victoria.* (C.B., 1866; K.C.M.G., 1872.)

Veronica, a large genus of the family Scrophulariaceae (q.v.), abundant in temperate

and cold climates and ascending to high elevations. Fourteen species are indigenous to Australia. *V. densifolia* forms shrubby clumps, with attractive mauve flowers, on Mount Kosciusko and the Victorian Alps; *V. Derwentia* and *V.*

V. Derwentia.

perfoliata are highly ornamental shrubs found on the coast and the tablelands, the former ranging from South Australia and Tasmania to Queensland, the latter extending from New South Wales to Queensland.

Viaducts and Bridges. Meehan's plan of Sydney plotted in 1807 indicates the position of two bridges across the Tank Stream, one marked 'Stone Bridge, fell down, but now rebuilding.' A third, not shown on the plan, was the Bon Accord bridge at the mouth of the Tank Stream. These structures served the needs of the early colonists, large rivers being unknown in the Sydney-Parramatta-Windsor area; but the construction of the road across the Blue Mountains in 1814, and the subsequent opening up of highways throughout the colony, necessitated the building of a large number of road-bridges across the inland streams. Timber of excellent quality existed in abundance. Long straight trees of suitable size for pile foundations were found in great quantities; low-level bridges were constructed of round timber, the upper portion of the logs being adzed flat to receive the decking. Many, however, of the early timber bridges were destroyed by flood and fire, and in 1832 Major Mitchell obtained the services of David Lennox (q.v.) to design and supervise the construction of stone bridges of a permanent character. Lapstone bridge on the main Bathurst road, built by Lennox in 1832-3, is the oldest stone bridge in Australia.

When railway construction began in 1850, standard type bridges were introduced. In no other country in the world has timber of such exceptionally high strength been found in quantities and size sufficiently large for bridge-building purposes. Its durability is shown by the fact that eight bridges of various types, totally unprotected from the weather, gave an average life of 33 years.

The old railway bridge over the Hunter River at Singleton consists of five timber arched openings each 80 feet in the clear, and two small masonry arches. This bridge has now been abandoned for railway purposes, but is still in use for heavy road-traffic, although it has had a life of over 50 years.

The timber truss bridge illustrated on plate xli (top) is typical of hundreds of similar bridges erected in various parts of New South Wales, which carried the traffic for many years. The expanding settlement of the country, with the heavier loading brought about by the development of the wool, mining, and other industries, necessitated the introduction of truss bridges of modern type which gradually replaced the old form.

A laminated arch bridge, typical of several erected in the early days of bridge construction, spans the Huon River in Tasmania; its piers and abutments are also of timber, and the structure has had a life of over 40 years without complete renewal.

In Western Australia the plentiful supply of hardwoods of great strength and durability enabled pioneer engineers to construct timber beam and truss bridges throughout the colony at moderate cost, and many truss bridges constructed entirely of jarrah still carry highway and railway traffic.

Modern Railway Bridges. New South Wales.—In 1884 it was decided to bridge the Hawkesbury River in order to complete railway connection between Sydney and Newcastle. This bridge (plate xl) consists of seven spans of 416 feet each; the foundations of the piers are of concrete cased in steel caissons, the upper part of both piers and abutments are of masonry. Each span was constructed on Dangar Island, near the bridge-site, and floated to its position for about 4000 feet on pontoons. The undertaking was notable as marking the introduction on a large scale of eye and pin connections in the tension members, and because of the exceptional depth (120 feet below the river-bed) to which the piers were carried. The bridge was opened for traffic in 1889, the contract price being £327,000.

On the North Coast line in New South Wales there are several modern steel bridges; a typical one at Kempsey, over the Macleay River, consists of three 200-feet steel spans and two 66-feet plate-girder spans, with ironbark timber approaches. The footway is carried on cantilevers. The bridge was completed in 1917 at a cost of £31,000. Steel bridges of this type have been adopted by the railway commissioners of New South Wales as standard, and standard types of timber-truss and compound-beam bridges, capable of carrying modern engine-loads, have also been introduced.

Victoria.—The railway bridge over the Maribyrnong River near Footscray is a double-track structure built in 1913, which carries the traffic of three main lines besides suburban traffic. The main steel trusses have a 210-feet span and a depth of 37 feet at centre. This bridge replaced a box-girder bridge on the same abut-

ments, and, though an average of 15 trains per hour crossed the bridge, the replacement was safely carried out without interference with traffic.

Single-track country bridges are usually of timber, the piers consisting of piles, double-braced. A railway trestle at Neerim in Gippsland, erected in 1918 and designed to carry 120-ton locomotives, was built on a curve of 8 chains radius; the highest pier is 95 feet on the centre-line and 112 feet on the lowest side. There are four openings of 41-feet steel girders, 19 openings of 20-feet timber beams, and four openings of 15-feet timber beams.

Queensland.—The Albert bridge over the Brisbane River at Indooroopilly, completed in 1895 at a cost of £70,894, consists of two 340-feet double spans of double-intersection hog-back girders. The piers and abutments are of faced masonry, the former standing on wrought-iron elliptical caissons filled with concrete. The centre pier is 100 feet above the bed of the river. The Alexandra bridge over the Fitzroy River at Rockhampton, built in 1899, is a double-track structure 843 ft. 6 in. long, consisting of three 100-feet rectangular Linville-truss spans and two 246-feet hog-back Linville trusses. The abutments and piers are of concrete, the latter founded on wrought-iron caissons filled with concrete. Lockyer Creek bridge (plate xl), built in 1911-12 on a deviation over that creek on the main southern and western railway, was the first large span reinforced-concrete-arch railway-bridge erected in Australia. It consists of three main arches of 40-feet rise, the centre arch having an 80-feet span; these arches are connected to the abutments at each end by three approach-arches of 13 feet clear span, giving an overall length of 330 feet between abutments. The Bremer River bridge at Ipswich, opened in 1915, was erected alongside an older structure, and consists of three 150-feet Pratt-truss spans on cast-iron cylinders and concrete abutments.

South Australia.—A viaduct on the Adelaide to Serviceton railway, 8½ miles from Adelaide, consists of 21 plate-girder spans of 30 feet each, constructed on a curve over a gorge 96 feet deep; the bridge over Cox's Creek on the same line consists of four lattice-girder spans of 70 feet on cast-iron cylinder piers. This railway crosses the Murray River by a lattice-girder span bridge—five river spans of 121 ft. 5 in. each on cast-iron cylinder piers, and 23 spans of 60 feet each crossing a swamp.

Other lattice-girder bridges are that which crosses the Onkaparinga River (Adelaide to Willunga line) by three spans of 71 ft. 6 in. each, on concrete piers; that which crosses the Broughton River (Adelaide to Gladstone line) by five spans of 80 ft. 11 in. on cast-iron cylinder piers; and that over the Neales River (Port Augusta to Oodnadatta line) which has 19 spans, each of 101 ft. 6 in. carried on cast-iron piers.

As in other States, many of the railway bridges in South Australia have been either replaced or strengthened to carry increased engine loads. An interesting engineering work of this character was carried out in connection with the railway bridge over the Torrens River on the main North and Port Adelaide lines, which was recently remodelled and a new structure of 112-feet span added.

Western Australia.—In this State jarrah has been largely used for railway bridges. The double-track bridge over the Swan River at Fremantle has four spans of 50 feet, eight of 30 feet, and 14 approach-spans of 15 feet, all the truss-spans being of jarrah. Similar use has been made of this timber in the East Perth, Belmont, and Guildford bridges over the Swan River, each of which has two truss-spans of 40 feet along with 15-feet beam-spans. The bridge over the Blackwood River at Bridgetown has 30 timber beam-spans of 15 feet on a 20-chain curve. Another over the Avon River at Toodyay has 49 such spans, with round stringers, partly on a 10-chain curve.

Tasmania.—A steel lattice-girder bridge of 100-feet span, carried on masonry piers and abutments, crosses the South Esk River on the Launceston-Burnie railway. There is also a fine lattice-girder structure of 200-feet span over the King River on the line from Emu Bay to the west coast. Many other bridges on the Tasmanian railways are of the plate-girder type, borne on masonry piers.

Modern Highway Bridges. New South Wales.—In 1895 a timber truss bridge was erected over the Murrumbidgee River at Wagga to replace an old bridge of laminated arch construction which had been in use for 33 years. The new bridge was when opened the largest timber truss span erected in the colony. It consists of three truss-spans of 110 feet and nine approach-spans of 35 feet; the trusses are spaced 27 feet apart, and connected by top and bottom systems of lateral bracing. In a still larger truss bridge of similar type, constructed over the Macleay River at Kempsey, the trusses were designed for a span of 153 feet, necessitating truss timbers of exceptionally large dimensions; the top chords of the trusses consist of two ironbark flitches 18 inches deep by 6 inches thick, and many lengths of over 30 feet, entirely free from heart, were required. The bottom chords were built-up members of ironbark flitches, 14 inches deep by 7 inches thick. All the timber for the four truss-spans and the approach-spans was obtained in the Macleay district. The truss timbers were hewn, two flitches being channelled out, well clear of the heart, from one tree. This bridge consists of four timber truss-spans of 153 feet each, supported on iron cylinder piers 6 feet in diameter, with nine timber approach-spans; the length over all was 925 feet. It was completed in 1900 at a cost of £22,345. Some of the piers, sunk by the pneumatic process, were carried 84 feet below low-water mark.

At the period when these large timber bridges were erected, practically no constructional steel was manufactured in Australia. But the growing scarcity of ironbark and other suitable timbers of large dimensions, combined with the difficulty and cost of replacing the bottom-chord tension members when decayed, led to the introduction of a composite type of bridge in which the bottom tension member was of steel. Since the establishment of blast furnaces in New South Wales this can be rolled locally. The bridge over the Lachlan River at Cowra consists of three truss-spans of 160 feet each and four truss-spans of 90 feet each, the length over all (including approach spans) being 1040 feet. In the trusses the top chords, principals, and diagonal bracings are of ironbark timber, the bottom chords being made up of steel stringer-plates, with top and bottom angle-plates. The main trusses are carried on iron cylinder piers. The total cost of this bridge was £30,115.

Many bridges of this composite type, but with parallel top and bottom chords, have been erected, and have proved economical, the renewals of the timber portion being readily effected.

High-level bridges of all-steel construction are numerous. The high-level bridge over the Hunter River at Luskintyre replaced a former low-level structure. The new bridge consists of two steel truss-spans, the total length being 916 feet. It was erected in 1903 at a cost of £19,700. A similar truss bridge crosses the Hunter River at Singleton.

Among bridges with a swing- and lift-spans should be noted the Parramatta (Gladesville) bridge, designed in 1877—five wrought-iron non-continuous lattice girders, and a swing-span having an opening of 60 feet on one side and 57 feet on the other side of a central pier. The Lane Cove bridge at Fig Tree, completed in 1885, has four plate-girder spans with a swing-span, working over an abutment, that gives an opening of 47 ft. 6 in.

A lift bridge (the first of its kind in the State) across the Darling River at Bourke consists of four 60-feet lattice-girder spans with timber approach-spans, and a steel lift-span giving 51 ft. 6 in. clear waterway between cylinders. Lift bridges of similar type have been erected over the Tweed River at Murwillumbah (plate xli, fig. 2), and at Wentworth, Wilcannia, Tocumwal, and Swan Hill. The bridge over the Wilson River at Telegraph Point has a basculetype lift-span of 47 feet, one truss tower-span carrying curved balance-weight tracks, and three compound timber beam-spans, all carried on Monier cylinder piers. A similar bridge spans the Murrumbidgee River at Darlington Point.

In Sydney a swing-bridge across Darling Harbour connects Sydney with the suburb of Pyrmont, another connects Pyrmont with Glebe Island. The Pyrmont bridge, completed in 1902 at a cost of £112,500, has an electrically operated swing-span weighing 780 tons. The caisson of the central pier is a double wrought-iron shell of 53 feet external diameter; the swing (which opens in 1½ minutes) is a steel structure bearing on a central pin and supported on a circle of anti-friction rollers. The Glebe Island bridge is also electrically operated, the weight of the swing-span being 650 tons.

Victoria.—The Murray is crossed by several lift-bridges erected at the joint expense of New South Wales and Victoria. Prince's bridge at Melbourne is described under LENNOX, DAVID.

Queensland.—The Victoria bridge, situated 15 miles from the mouth of the Brisbane River, connects Brisbane with the suburb of South Brisbane. It was opened for traffic in 1897, the total cost being £108,615. A bridge erected in 1874, consisting of 11 fixed spans and two openings crossed by a double swing-span to permit of river traffic, was carried away by severe floods in 1893. The present bridge consists of six 170-feet steel-spans, with three main girders in each span, providing two carriage-ways of 24 feet each and two footways of 9 feet each, carried on iron cylinder piers, and masonry and concrete abutments. Its length over all is 1040 ft. 8 in., and the width between the footway parapets 73 feet. The footways are cantilevered out from side girders which separate the roadways from the foot-passenger traffic. The whole of the iron and steel work was fabricated in Queensland.

The suspension bridge over the Fitzroy River at Rockhampton, completed in 1890 at a cost of £54,433, consists of four spans of 232 feet and two shore spans of 88 feet each, the length over all being 1104 feet.

South Australia.—The bridge across the Torrens River, connecting Adelaide with its suburb of North Adelaide, carries a double track for the electric tramways, with roadways and footpaths. The bridge is constructed of plate girders, two under the inner rail of the tram-track 6 ft. 6 in. deep, and 2 feet wide; two pairs 7 ft. 6 in. deep by 2 feet wide under the outer tram-tracks with two side girders each 7 ft. 6 in. deep by 2 feet wide, carrying brackets supporting the footpaths on either side of the bridge.

Western Australia.—The bridge over the Helena River at Guildford, erected in 1902 on the main road connecting Perth with Guildford and Midland Junction, was constructed entirely of jarrah. It consists of two 25-feet, 65 20-feet, and two 18-feet beam-spans, the length over all being 1389 feet and the width 21 ft. 2 in. The bridge over the Preston River at Boyanup, built in 1912 to connect Bunbury with Bridgetown, consists of two 18-feet and 11 20-feet standard beam-spans constructed of jarrah; the length over all is 259 feet. The roadway is 15 feet wide. A bridge over the Swan River at Guildford, erected in 1904, consists of two 18-feet and 13 20-feet beam-spans of jarrah, and one 40-feet truss-span of composite iron and jarrah. The roadway is 17 ft. 2 in. between standards.

Tasmania.—The rivers and waterways of this State are not subject to severe floods; the use of arches and of stone construction is therefore possible. The Perth bridge over the South Esk River, on the main road between Hobart and Launceston, is an example of stone arch construction. The spans are 30 feet. Another is the Ross bridge, also on the main road. The carving on these arches was executed by convict labour. The King's bridge at Launceston is a single steel arch over the South Esk 195 feet long, the roadway being 50 feet above water-level. The arch, which was designed by an engineer named Dryne, has a formation width of 50 feet; it has now been duplicated. A bridge on the main road between Launceston and Burnie consists of 40-feet spans constructed of rolled beam girders with 6-feet concrete arches between them. Masonry piers give a massive appearance to the structure. The Latrobe bridge over the Mersey River has two 70-feet spans with masonry piers and abutments.

An interesting example of a timber bridge constructed on a curve is the St. Helens bridge (plate xli, fig. 3), on the main road to the east coast; its timber-spans are supported by 25-feet masonry abutments and wing walls. The timber bridge over the tidal Huon River has already been mentioned.

The Alexander suspension foot-bridge over the Cataract gorge at Launceston is formed of steel wire-rope cables carrying a 6-feet deck.

Reinforced-concrete bridges. New South Wales.—A reinforced-concrete bridge erected over the Lane Cove River near Sydney, completed in 1918 at a cost of £5480, consists of six spans of 30 feet; the piers are of reinforced concrete carried on driven piles. The roadway has a width of 24 feet between kerbs. The bridge over Mullet Creek near Wollongong consists of four 30-feet and two 12-feet reinforced-concrete spans, built at an angle of 60 degrees to the centre-line of roadway. It was completed in 1915, the cost being £2791. Another, erected over American Creek at Fig Tree on the main South Coast road, consists of six reinforced-concrete spans of 12 feet, and two of 10 feet. The arch bridge over the Hawkesbury River at Richmond is a low-level structure of 13

NEW SOUTH WALES
SOUTH AUSTRALIA
TASMAN SEA
BASS STRAIT
Mildura
Hay
Narrandera
Cootamundra
GOULBURN
WAGGA
CANBERRA
Queanbeyan
SWAN HILL
LAKE TYRRELL
LAKE ALBACUTYA
LAKE HINDMARSH
Deniliquin
Finley
Tocumwal
Kerang
Cohuna
Echuca
Numurkah
Rutherglen
Wangaratta
Benalla
Euroa
Wodonga
Beechworth
ALBURY
Dimboola
Horsham
St Arnaud
Inglewood
BENDIGO
Castlemaine
Seymour
Mansfield
Alexandra
Yea
Stawell
Maryborough
Ararat
Daylesford
Creswick
BALLARAT
MELBOURNE
Dandenong
Frankston
Sale
Traralgon
Bairnsdale
Yarram
Port Albert
Wonthaggi
Cape Schanck
Queenscliff
Cape Otway
Camperdown
Colac
GEELONG
PORT PHILLIP
Mortlake
Terang
Koroit
Port Fairy
WARRNAMBOOL
Portland
Casterton
Coleraine
Hamilton
Naracoorte
Wilsons Promontory
Scale of Miles
H.E.C.R.
141
142
143
144
145
146
147
148
149
150
35
36
37
38
39

VICTORIA

reinforced-concrete arch-spans of 50 feet each in the clear, carried on concrete piers and abutments. The width of roadway is 20 feet, and the length over all 722 feet. Each pier consists of two concrete caissons 10 feet by 5 ft. 6 in., with rounded ends. After sinking, and before filling the interior of the caissons, three steel rods in each caisson, 10 feet long by 2 inches diameter, were embedded 4 feet in solid rock, and concrete was then packed round the upstanding lengths. A movable handrail of wrought-iron piping and chains is carried along each parapet wall, and during floods is closed down into grooves in the coping. The bridge was completed in 1905, the cost being £20,225.

A reinforced-concrete bridge over Throsby's Creek at Maryville near Newcastle was designed to carry tramway traffic: it, and several other bridges of similar type were constructed by the State Monier-pipe works.

Victoria.—The bridge over the Yarra at Anderson-street, Melbourne, consists of three elliptical arch-spans of 95 feet each; the arches have a rise of 10 feet at centre, and the arch-rings a thickness of 20 inches at the piers and 16 inches at the crown. The two river-piers are 9 feet thick at the base, and taper to 5 feet at the springing. The total width of the roadway is 30 feet.

Queensland.—An arch bridge similar in design to the bridge already described at Richmond, New South Wales, erected over the Mary River at Maryborough in Queensland, consists of 11 reinforced-concrete arch-spans, each 50 feet in the clear, carried on concrete piers and abutments. Its total length is 613 feet, the waterway between the faces of the abutments being 595 feet. The width between faces of arches is 22 ft. 8 in., and the clear roadway between kerbs 20 ft. 8 in. The roadway is 12 ft. 6 in. above high water. In February 1893 a flood that rose to 33 feet above high-water mark partially destroyed the old high-level timber bridge, 1456 feet in length; a low-level bridge is safer during floods, since floating logs, trees, etc. are not carried downstream in any considerable quantity until low-level bridges are entirely submerged. A low-level bridge is also much shorter; the new Mary bridge is 843 feet shorter than the high-level bridge it replaced. Since completion several heavy floods have passed over it, doing no damage to the structure.

In *South Australia* many such bridges have been erected. The bridge over the Torrens River at Cudlee Creek consists of a reinforced-concrete arch-span of 91 feet clear, the arch rise being 15 feet; the roadway is 21 feet wide. The bridge over the River Wakefield at Auburn, a concrete bridge with steel superstructure, consists of a centre span of 61 ft. 2 in. and two side spans of 58 ft. 7 in.; the piers and abutments are constructed of massed concrete, founded on a bottom of stiff clay. The bridge over the River Gilbert at Saddleworth is a typical reinforced-concrete bridge. In this case there are three spans of 30 feet each, the roadway being 18 feet.

See SYDNEY HARBOUR BRIDGE. J.J.C.B.

Victoria, the smallest, but most densely populated and proportionately most productive State on the Australian mainland, formed up to the middle of 1851 a part of the colony of New South Wales, being known, after settlement, as the Port Phillip district. Its coasts were explored between 1797 and 1802, chiefly by George Bass (q.v.) and Matthew Flinders (q.v.), and in 1803 an abortive attempt was made to form under the command of Colonel David Collins (q.v.), a convict settlement on the shores of Port Phillip. However estimable an officer Collins may have been in other respects, he was not built to be the leader of a band of pioneers in the wilderness. Having disembarked his establishment on an unsuitable spot just inside Port Phillip heads, he was deterred from thoroughly examining the upper part of the harbour by reports of the hostility of the blacks, thus missing the opportunity of founding a settlement which might soon have rivalled that of Port Jackson; he therefore seized the first chance to remove to the Derwent River in Tasmania, where a small military station had already been established under Lieutenant John Bowen (q.v.). It thus came about that Port Phillip was abandoned early in 1804 and those southern coasts of New South Wales remained neglected for over 20 years, although doubtless they were visited by the whalers and sealers who frequented the islands of Bass Strait. Meanwhile by 1824 settlement had spread from the Sydney side as far as the head-waters of the Murrumbidgee, and towards the close of that year Hume and Hovell (q.v.) set out from Lake George on an exploration southwards. Though this expedition was really the outcome of a recommendation made by Bigge, the commissioner who visited New South Wales in 1820 to enquire into the state of affairs under Macquarie's administration, it was nevertheless undertaken almost entirely at the expense of the explorers themselves. They succeeded in reaching Port Phillip Bay (which they mistook for Western Port) at a point a few miles north of the present Geelong, and returned with reports of the discovery of numerous rivers and fine open country. The only immediate result was that, when it was decided in 1826 to establish a military post at Western Port as a precaution against the supposed colonizing intentions of the French, Hovell was sent with the expedition in an advisory capacity. But the occupation of Western Port lasted only from November 1826 until January 1828, and once more the southern districts were abandoned to aborigines and sealers.

Tasmania (or Van Diemen's Land, as it was then called) had by this time attracted a number of settlers in addition to the convict population; but the amount of pasture-land available, or easily accessible, in the island colony was limited, and envious eyes were turning towards the unoccupied country on the other side of the strait. Hume and Hovell's accounts of its fertility must have reached the ears of the Tasmanian colonists; doubtless also there was some traffic carried on between the two coasts by whaling and sealing parties. In January 1827 John Batman and J. T. Gellibrand wrote from Launceston to the governor of New South Wales, soliciting permission to take up land at Western Port and stock it with sheep and cattle; but this request was refused. In November 1834 Edward Henty (q.v.)—who, with his father and brothers, had been disappointed in a venture at the Swan River colony in Western Australia, and had arrived in Tasmania too late to obtain free grants of land—boldly settled on the shores of Portland Bay, and subsequently procured from the colonial office a sort of tacit consent to his remaining there. This was the first permanent settlement in Victorian territory, but owing to its isolated position, and the indifferent shelter

afforded to shipping, it had no immediate development. It was reserved for John Batman and those who followed him in 1835 to do the real pioneering work which laid the foundations of the colony. Forming the somewhat remarkable plan of purchasing a large tract of country from the natives and afterwards endeavouring to obtain official ratification of the transaction, Batman secured the co-operation of a number of prominent Tasmanian settlers and in May 1835 crossed the strait to Port Phillip in the schooner *Rebecca*. Landing on the western side of the bay, he made several excursions inland and was delighted with the appearance of the country. Eager as he was to carry out the scheme before mentioned, it took him a week to locate a party of blacks sufficiently large for his purpose. When at length he found a tribe of 45 individuals—men, women, and children—he soon persuaded himself that he had discovered among them 'eight chiefs . . . . who possessed the whole of the country near Port Phillip.' Aided by some semi-civilized Sydney blacks whom he had brought with him, Batman explained to these unsophisticated magnates that he wished to purchase about 600,000 acres of land, and proceeded to hand over to them 'blankets, knives, looking-glasses, tomahawks, beads, scissors, flour, etc.,' together with the promise of a yearly tribute. After this unexpected munificence there was no trouble in persuading the 'chiefs' to put their marks on some elaborate parchment deeds which Gellibrand had prepared for the occasion and which purported to be a conveyance of the land. There were two of these documents, each prepared in triplicate—the first referring to 500,000 acres lying north and west of Port Phillip, including the site of Melbourne, and the second dealing with 100,000 acres in the vicinity of Geelong. Copies of the original deeds are preserved in the public library of Victoria, where also may be found the journal kept by Batman on this expedition. There has been some dispute as to the scene of this extraordinary transaction, but it seems most probable that it took place on the banks of the Plenty River, near the present Greensborough, 12 or 13 miles north-east of Melbourne. Having completed these mummeries, which included the handing over of some earth by the blackfellows as a token of delivering possession, Batman prepared to return to Tasmania; but, being delayed by a contrary wind, he found time to make a boat trip up the Yarra as far as the site of Melbourne. He was impressed by the promise of a constant water-supply furnished by the river, and marked on his map a situation at its mouth as suitable for a 'village;' his own depot, however, he established at Indented Head, where his men could keep an eye on the entrance to the harbour.

Hardly had Batman got back in Launceston when another expedition prepared to set out for the new country. This was organized by John Pascoe Fawkner (q.v.), an inn-keeper, who started out with his party but was forced by sea-sickness to return. In the schooner *Enterprise* William Jackson, George Evans, Robert Hay Marr, and John Lancey, with some servants of Fawkner's, headed for Western Port in July 1835. There they landed, and made a search for a site adapted to settlement; but, failing to find a spot to meet their requirements, they proceeded round to Port Phillip, and after some delay worked their schooner up the Yarra, until stopped by a bar of rock which ran across the bed of the river. Unloading their stores, they put up a couple of turf huts near the river-bank. John Helder Wedge (q.v.), who had come over to inspect the country as one of Batman's associates, came upon this camp a day or two after its formation. He endeavoured to persuade the new-comers that they were intruding on private property, but without success; and he accordingly brought some of his party from Indented Head to keep an eye on them. This was the real beginning of the town of Melbourne.

Batman's partners had by this time formed themselves into a 'Port Phillip Association,' and within a month or two they began to send stock across to Port Phillip. Their hopes of establishing a monopoly in the fine pastoral country adjoining the port were not realized. Not only were their tracks quickly followed by other enterprising stock-owners in Tasmania, but the government utterly declined to recognize Batman's land deal, and it was only after prolonged negotiations that the association was allowed some compensation for its pioneering activities in the shape of a remission of £7000 in the purchase-money of a block of land lying west of Geelong—a paltry 9000 acres in place of the 600,000 ceded by the aboriginal chiefs. By this time the association had shrunk into a smaller 'Derwent Company,' and in a few years it disappeared altogether. John Batman, its leading spirit, died in Melbourne in 1839.

To understand the spread of settlement which followed the opening up of the Port Phillip district by Batman's and Fawkner's parties, something should be known of the physiography of the colony. Taking the boundaries of the present State of Victoria, we find that they describe roughly an isosceles triangle, of which the base is the 141st meridian, dividing it from the State of South Australia, and the apex is Cape Howe, on the extreme east; the sides are formed by the coast-line on the south and the Murray River on the north. Entering this triangle from the north-east, the Great Dividing Range shuts off the plains of Gippsland—which lie in the south-east quarter—by a stretch of rugged mountain country, but offering to the explorer and pioneer from the north a fairly easy road in a south-westerly direction. By this way Hume and Hovell had reached Port Phillip in 1824. The followers of Batman, entering the harbour from the south, and landing their flocks at either Hobson's or Corio bay on the western side, found grassy plains stretching before them right to the South Australian border. Though at first held back by the active hostility of the blacks, who soon commenced to commit depredations and to waylay and murder small parties of whites who chanced to become isolated from their fellows, they had fairly well occupied this 'Western District,' as it is still called, by the end of 1838. Another wave of settlement came from the north, starting in good earnest about a year later than the Tasmanian invasion. Major T. L. Mitchell (q.v.), the surveyor-general of New South Wales, had made an exploratory journey down the course of the Murray in 1836 (see EXPLORATION BY LAND), and, after an extensive detour southwards, returned to the settled districts, leaving a well-defined track which helped to lure in a south-westerly direction the 'overlanders' who had commenced to push over the border. Meanwhile, due west lay the northern plains of what is now Victoria, watered by numerous rivers flowing into the Murray, and

along the courses of these squatting stations began to be formed. The two tides of settlement joined by way of the Loddon, Avoca, and Wimmera rivers, which start far in the south; and within ten years of Batman's landing the only part not yet invaded by the 'squatter' was the far north-west corner, covered with mallee scrub. Gippsland was reached by a separate incursion of pastoralists from Monaro, driven by a prolonged drought about 1838 or 1839 to seek new country; and by 1841 Angus McMillan (q.v.) had made his way right down to the coast and found some sort of a shipping port for cattle at Corner Inlet.

The attitude of the governors of New South Wales and Tasmania respectively towards this unauthorized expansion of settlement to a hitherto neglected corner of the mainland is of some interest. Colonel George Arthur, the lieutenant-governor of the island colony, would fain have added the Port Phillip coasts to the territory under his jurisdiction, although, as in duty bound, he advised his superior officer, Sir Richard Bourke, governor of New South Wales, of the doings of Batman, among whose associates was Arthur's own nephew. Bourke was under no misapprehension as to his authority over the whole of the country occupied, and promptly issued a proclamation warning off trespassers. At the same time he assured the secretary of state for the colonies that it was futile to try to check the natural outflow of flocks and herds to new pastures, and suggested that he should be allowed to form a township and establish some form of government control on the southern coasts. This was duly agreed to, and towards the end of 1836 Bourke sent a police magistrate, Captain William Lonsdale, with a staff of customs officials, surveyors, etc., some convict labourers, and a military guard to Port Phillip, where it was found convenient to establish them in the village which had sprung up on the banks of the Yarra. The governor himself came over in March 1837 and directed that a town should be laid out there and receive the name of Melbourne. The founding of Geelong followed in 1839, and that of Portland in 1840, and before long one or two villages came into existence on the north-eastern highway already mentioned. With the rising importance of the district, it was felt that magisterial supervision was not in itself sufficient; and in 1839 Charles Joseph Latrobe (q.v.) was sent from England to assume the office of 'superintendent.'

The period from 1835 to 1851 was essentially the squatting period in the history of Victoria, during which enterprising pastoralists opened up practically every district (see PASTORAL INDUSTRY). To supply the demand for labour, shiploads of free immigrants were sent to Port Phillip, and in 1839-40 the newly opened settlement underwent a 'boom' which resulted in its rapid progress. This, however, happened on the brink of a severe financial crisis which affected the whole of New South Wales and threatened the pastoral industry with ruin. Live stock became unsaleable, and it was only after recourse to the expedient, in 1843, of 'melting down' sheep for their tallow that the corner was turned and a return to prosperity became possible. The colonists of the Port Phillip district prided themselves on the fact that the settlement which they had founded had never been a penal colony, and they protested vigorously when, in 1844, the British government began to send out to Melbourne 'exiles' with conditional pardons—in reality a thinly veiled form of transportation. In 1849 a cargo of ticket-of-leave men was despatched to Port Phillip; but the colonists showed so unmistakably their determination not to submit to this further imposition that the ship was sent on to Sydney without discharging her passengers. A demand for the separation of the Port Phillip district from the rest of New South Wales, and for its creation into an independent colony, arose very soon after the first official recognition of the settlement, the colonists chafing under what they regarded as the neglect of their interests by the far-away government at Sydney; and the news, received towards the end of 1850, that the royal assent had been given to an act 'for the better Government of Her Majesty's Australian Colonies,' which provided, among other things, for the transformation of Port Phillip into the colony of Victoria, led to widespread rejoicing.

The inauguration of the new colony on 1 July 1851 was practically contemporaneous with the discovery of payable goldfields within its boundaries and with the beginning of the 'gold rush' which had so remarkable an influence upon the destinies of Victoria, cramming into the space of four or five years developments which otherwise might have taken a quarter of a century. In 1841 the population of the Port Phillip district was 11,738; in 1851 it had risen to 77,345; by 1857 Victoria had far out-distanced the mother colony of New South Wales, and possessed 408,998 inhabitants. The reason of this sudden rise to the position of the foremost colony of Australia was, of course, the immense superiority of the Victorian goldfields, including, in Ballarat, Bendigo, and Forest Creek (Castlemaine), some of the most famous alluvial diggings in the world. Of the total value of gold raised in Australia between 1851 and 1920 —in a round sum £605,000,000—Victoria has contributed nearly half; and of this amount £87,000,000 worth was won in the fifties, as compared with a New South Wales production of £10,000,000 during the same period. Alluvial mining on any considerable scale flourished only during the first few years, being rapidly replaced by more extensive deep-sinking operations carried out by mining companies; but during the 'rush' years 1851-3 it attracted to Victoria some 200,000 immigrants from other colonies and from beyond the seas. The natural result of this vast influx of population was a period of confusion and dislocation of society, when everybody was 'off to the diggings;' but the storm soon passed over, and even by 1854 things were beginning to settle down. It was at this stage that Latrobe, who had been promoted to the position of lieutenant-governor in 1851, resigned, and was succeeded by Sir Charles Hotham, a captain in the royal navy, who arrived in June 1854. Hotham's career as a colonial governor was a brief and stormy one. He had first of all to deal with an *émeute* on the goldfields, where the diggers, exasperated at their treatment by officialdom, broke into open revolt at Eureka, near Ballarat (see EUREKA STOCKADE). This brief outburst, although it involved collision with the military, and unfortunately some loss of life, really did something to clear the air and obtain more substantial justice for the miners. It was followed, not long afterwards, by a political crisis connected with the transition to responsible government; in the midst of all these worries Sir Charles Hotham died (December 1855). The period of his governorship had been marked by the inauguration of the Victorian

railway system, a short line being opened from Melbourne to Hobson's Bay in 1854; this was the first railway to come into actual operation in Australia. Coaching had commenced a year or two earlier, and some Americans, headed by Freeman Cobb, the founder of the famous firm of Cobb and Co., were beginning to put it on an efficient basis. The growth of coaching (see RUTHERFORD, JAMES), and the carting of supplies to the goldfields, had made imperative some attention to the formation of roads throughout the colony. A central road board, formed under an act passed by the legislative council of Victoria in 1853, was now administering large government grants, and the formation of district boards, to take over the care of by-roads, had begun. The creation of 'municipal districts' was also made possible by an act of 1854, and these two classes of bodies formed the germ of the Victorian system of local government.

The progress of Victoria to the stage of responsible government came about in the following manner. The act of 1850, under which the colony was first constituted, provided for a legislative council, partly nominated by the lieutenant-governor and partly elected by persons having a certain property qualification. As the population grew with the rush to the goldfields, the membership of the council was increased, and eventually the franchise was extended to gold-diggers holding licences. In 1853 the council was invited by the imperial government to frame a constitution for the colony on the same lines as that of Canada, with two houses of legislature and responsible ministers. In connection with this new constitution the legislative council of Victoria passed, early in 1856, the first effective provision for voting by ballot (q.v.) brought into use among English-speaking peoples. In July 1855 the Constitution Act received the royal assent, after discussion and slight amendment by the British parliament, and in November the first parliament, consisting of two houses (a legislative council and a legislative assembly), met in Melbourne. In 1857 the Victorian parliament adopted the principle of 'manhood suffrage,' and in this matter also Victoria was a pioneer. The ground was thus prepared for democratic experiments which had some interesting results. Sir Charles Hotham, who had been granted the title of 'Governor-in-Chief' before his death, was succeeded by Sir Henry Barkly, who arrived in December 1856 and remained in office until 1863. The term of his governorship was marked by several attempts to deal with what had become a burning question—that of settling an agricultural population on the land heretofore so largely occupied by squatters. The principle of 'selection' was introduced, but there was much 'dummying' by squatters desirous of retaining their old monopoly. Not until several experiments in the way of 'land acts' had been tried did the problem receive a satisfactory solution. In the meantime it is interesting to note the development of affairs as revealed by statistics. The gold-rush had brought agriculture practically to a standstill. The area of land under cultivation declined from 57,472 acres in 1851 to 34,816 in 1853, while the quantity of imported bread-stuffs increased nearly tenfold. Though during the same period the number of sheep decreased from 6½ millions to 5½ millions, there was a slight increase in the number of horned cattle; it is therefore evident that there was no serious interference with the pastoral industry. By 1861 Victoria was producing nearly 3½ million bushels of wheat to the 1½ millions of New South Wales, and by 1865 she had nearly 9 million sheep, surpassing in this respect even the mother colony.

Following on the settlement of the land question, 'Protection to native industries' became the war-cry of the democratic section of the population. A deadlock over the framing of a tariff for this purpose occurred between the council and the assembly in 1865-6, and in the latter year Sir Charles Darling, who had followed Sir Henry Barkly as governor, was recalled for having taken sides in the struggle. He was succeeded by Sir J. H. T. Manners-Sutton, afterwards Viscount Canterbury. By this time the Victorian railway system had grown to considerable proportions, lines being opened from Melbourne to Geelong in 1857, from Geelong to Ballarat and Melbourne to Bendigo in 1862, and from Bendigo to Echuca on the Murray in 1864. Two episodes of the sixties which deserve mention are the expedition under Burke and Wills in 1860-1 (see EXPLORATION BY LAND), and the visit of the Duke of Edinburgh in 1867.

In August 1870 the last of the imperial troops which had garrisoned Victoria ever since the foundation of the settlement sailed for England. The question of defence had long before received consideration from the Victorian government. In 1854 a volunteer force was established, and was largely augmented in 1859-60. An armed steam sloop, H.M.C.S. *Victoria*, was also obtained from England in 1856, and about the same time was begun the construction of earthwork batteries for the defence of Hobson's Bay. In 1871 the turret-ship *Cerberus* was purchased to form part of this scheme, but in the later seventies more attention was paid to the fortification of Port Phillip heads, under the advice of Sir William Jervois (q.v.).

Free, secular, and compulsory education under government auspices was decided upon in 1872, to replace the older system of 'common schools' under the control of national and denominational boards of education; and in the following year the education department commenced its operations with what are known as 'state schools.' Sir George Ferguson Bowen took the place of Viscount Canterbury, and in November 1873 performed the ceremony of opening the last section of the North-eastern railway line, which reaches the Murray at Wodonga and follows approximately the original track of the overlanders from New South Wales to Port Phillip. Direct rail communication between Melbourne and Sydney was established in 1883, although a difference in the gauge adopted by the two colonies renders necessary a change of trains at the border; in 1887 Melbourne was linked with Adelaide in the same fashion. In the late seventies railways were also extended through the Western District on the one hand, and eastward through Gippsland on the other, Melbourne continuing to be the nerve-centre of the system.

In 1878 another deadlock, on the question of the payment of members, occurred between the two houses of parliament. Associated with this crisis was the wholesale dismissal of public servants by the premier, Graham Berry, on 9 January 1878, a date afterwards known as 'Black Wednesday' (q.v.). At the close of the seventies there occurred in northern Victoria one of the best-remembered outbreaks of that form of crime known as 'bushranging' (q.v.), the

'Kelly gang' establishing in the district round Wangaratta and Benalla a reign of terror which lasted from the latter part of 1878 to the middle of 1880, when Edward Kelly (q.v.), the leader, was captured and his three companions were shot at the small rail-side township of Glenrowan.

The opening of the next decade was signalized by the holding of a great international exhibition in Melbourne in 1880-1, and by the visit of the late Duke of Clarence and his brother (now King George V), as midshipmen on board H.M.S. *Bacchante*, in 1881. About this time experiments were being made in the direction of freezing meat for export, and in 1882 a beginning of water-conservation works for the northern plains was made by the initiation of the Waranga basin scheme. In 1885 the neglected mallee country in the north-western corner of the colony began to come in for some attention as a wheat-growing area, the invention of mallee rollers and stump-jumping ploughs having made possible the subjection of what had heretofore seemed but useless scrub. The Chaffey brothers also started an irrigation settlement at Mildura on the Murray, having been attracted from California by the visit to the United States of Alfred Deakin (q.v.), who had been commissioned by the Victorian government to enquire into methods of water conservation and supply. In 1886, 50 years after the first official recognition of the settlement of Port Phillip, Victoria had acquired a population of over a million people, and seemed to be at the height of her prosperity. But the 'land boom' of the late eighties had brought with it an era of wild speculation and of both public and private extravagance, and this was followed by inevitable financial catastrophe. The depression of the early nineties was felt more or less all over Australia, but its effects were most severe in Victoria. The breaking of the 'boom' entailed the loss of her prestige as the foremost Australian colony, a position which she had held for nearly 40 years. Increase of population came almost to a standstill, and by the time of the census of 1901 New South Wales had regained the lead, and has held it ever since. Yet even this lean period had its compensations. Between 1889 and 1893 the butter produced for export increased from 828,882 lb. to 8,099,258, and abundant harvests in 1897 and 1898 helped to restore financial soundness.

In 1901 Victoria took her place as one of the States of the newly formed Commonwealth, of which the first parliament was held in Melbourne, where the temporary headquarters of the federal government have since remained, pending removal to the federal capital at Canberra (q.v.). The governors during the last 20 years of the 'colonial' period were the Marquess of Normanby (1879-84), Sir Henry Loch (1884-9), the Earl of Hopetoun (1889-95), and Lord Brassey (1895-1900).

Some notion of the present productiveness of the State may be gained from the fact that during the five years (1920-5) the average wheat-crop has been about 40 million bushels, while the yield of wool has averaged 100 million lb. In addition to the extensive fruit-growing districts and vineyards, where fruit for table use and wine-making purposes is grown, there has sprung up a dried-fruit industry, which has made such progress that, whereas the currants and raisins produced in 1904 were valued at £59,283, twenty years later the output was of an estimated value of nearly £1,000,000. Meanwhile factories increased from 68 in 1850 to 1740 in 1871, and to 7425 in 1925, giving employment in the last-named year to 177,398 persons, with an output valued at £118,177,398. The earliest factory legislation in Victoria was passed in 1873, when some restriction was placed upon the hours of employment for women; but in 1885 a Factories Act of much more extensive application was placed on the statute book. This provided for the registration of factories, and for their supervision with regard to sanitation, protection from machinery, and conditions of work; it also prescribed hours for the closing of shops, thus releasing from bondage many shop assistants who had before been entirely dependent on their employers for the duration of their working day. Victoria also introduced the wages board system to Australia in 1896, and in January 1901 was the first State to adopt an old-age pension scheme.

The estimated population of the State on 31 December 1925 was 1,684,017. The aboriginals, who gave so much trouble to the settlers 80 or 90 years ago, have almost entirely disappeared, and there are now not more than about 100 full-blooded Victorian blacks in existence. The imports for 1924-5 amounted to £54,294,705; exports for the same period were valued at £41,680,909. The latter included wool, £14,446,378; wheat, £10,413,976; dairy produce, £5,736,830; fruit (fresh and dried), £1,584,101; chilled meat, £1,112,127. Some 3000 state and private schools are in operation, and the railway mileage working is 4491. As the area of the State is only 87,884 square miles, this means that Victoria is better served with railways than any other part of the Commonwealth. More than half of the population is concentrated in the metropolitan area round Melbourne; the three principal provincial towns, Ballarat, Bendigo, and Geelong account for only about 90,000 between them. (See also MELBOURNE.)

For the early period see Bonwick's *Port Phillip Settlement* (London, 1883) and *Letters from Victorian Pioneers* (Melbourne, 1898); also Labillière's *Early History of the Colony of Victoria* (London, 1879). Sutherland's *Victoria and its Metropolis* (Melbourne, 1888) and Turner's *History of the Colony of Victoria* (London, 1904) are useful for later and political history. Various articles bearing on the subject will be found scattered throughout the pages of the *Victorian Historical Magazine*, and ample statistical information is provided by State and Commonwealth *Year Books*.

A.W.G.

Vigna, a genus of the family Leguminosae, consisting of prostrate, trailing, or twining herbs, widely distributed over warm regions. The flowers are greenish-yellow or purple, on short stalks of 2-3; leaves with 3 leaflets; pod narrow, nearly cylindrical. Along with its ordinary pods *V. lanceolata*, a twiner, produces underground pods from buried flowers, somewhat resembling the common peanut. In central Queensland this species is reckoned a yam, and its roots are eaten. The exotic *V. Catiang* is the Cow-pea.

Viminaria, a genus of the family Leguminosae, consisting of one species endemic in Australia. *V. denudata* has leaves normally without blades, and represented by the elongated leaf-stalk—which, reaching a length of 9 inches, conveys the impression of a drooping branchlet. It frequently forms dense shrubberies in swamps; these are occasionally devastated by bush-fires, and the resultant young growth, which arises in great profusion, is plentifully supplied with true leaves—a reversion to an ancient habit.

Viscum, a small genus of the family Loranthaceae, consisting of parasitic shrubs with insignificant green or yellowish flowers, the males and females distinct but usually in the same cluster. The fruit is a one-seeded berry. *V. articulatum,* found in eastern Australia, has flattened leafless branches, forked and jointed, and minute flowers half buried in a cup-shaped bract. Species of *Viscum* are frequently parasitic upon the loranths. *V. album* is the Mistletoe of Britain.

Vitex, a large and widespread genus of the family Verbenaceae, consisting of trees or shrubs with opposite compound leaves of 3 to 5 leaflets (rarely simple). The Australian species are confined to the eastern districts. *V. trifolia,* a shrub which extends from New South Wales to northern Australia, is also found in Asia, and in India an oil is extracted from its roots. The coastal *V. glabrata* (also Asiatic) produces a small fruit with a soft pulp eaten by the Burmese; its timber is gray with a satiny lustre, hard, close-grained and durable. *V. lignum-vitae* (Black Satinwood) has a hard, close-grained, blackish timber sometimes used by cabinet-makers.

Viticulture. Grape-vines were brought to Australia in the First Fleet from the Cape of Good Hope, and planted in the gully behind Farm Cove now occupied by the Sydney botanic gardens. Their yield was unsatisfactory, probably because the varieties introduced were not suited for coastal culture. At Rose Hill, farther from the sea, more success was obtained, and in 1791 Hunter reported 8 acres under vines. George Suttor in 1800, and John Macarthur in 1817, brought out European stocks and established vineyards on a commercial scale, and in 1824 the Australian Agricultural Company included vine-growing among its objects, in spite of the colonial office's protest against interfering with the vested interests of South African growers. The most important introduction of stocks was made by James Busby (q.v.) in 1831-2—over 1100 varieties from the best vineyards of Spain and France; about the same time James King (q.v.) was establishing Spanish and French varieties on the Williams River north of Newcastle; he experimented with Rhine valley vines also, but had little success with them. In 1838 Jules Joubert brought out vines from the Médoc district of France, and in 1840 H. J. Lindeman established an important vineyard at Cawarra on the Paterson River.

Vines were introduced into Western Australia in 1830, but the industry has not flourished there. In Victoria the first vines were planted by Edward Henty at Portland, but the first vineyard on a commercial scale was established in 1840 at Yering by William Ryrie. The South Australian vineyards date from 1838. Queensland has never taken vine-growing seriously, and the climate of Tasmania makes the industry impossible in that State.

Up to the 1850s New South Wales was the principal vine-growing colony. Three at least of its earliest vineyards are still productive—Kirkton near Singleton, planted in 1830 and partly stocked with Busby's vines; Dalwood near Maitland, also planted in the thirties; and Bukulla in New England (1848-9). Towards the end of the 19th century phylloxera devastated the vineyards near Sydney and along the Victorian border; the Sydney area, which was principally used for table-grapes, was never systematically replanted. The chief areas of the present day are (*a*) the Hunter valley, mainly devoted to wine-grapes from which good light-bodied wines are made; (*b*) the Corowa-Albury district, producing wines of greater body and alcoholic strength; (*c*) the closer-settlement and irrigation areas along the Murrumbidgee, where considerable areas of wine-grapes have been planted in addition to table-grapes and raisin-grapes. Some plantings are on phylloxera-resistant stocks. On the Paterson River, a tributary of the Hunter, good light wines are produced.

Victoria in 1860 had 1138 acres of vineyards, and steadily extended them until 1887, when phylloxera was discovered at Geelong and Bendigo. The Victorian government then offered a bonus of £2 per acre for vines planted in clean districts, and the vineyard area began to increase hugely—in 1880 5000 acres were under vines, in 1885 nearly 10,000, in 1890 over 20,000, in 1895 over 30,000. In 1899 phylloxera again made its appearance, this time near Rutherglen on the Murray, and the area decreased until 1914 (21,800 acres), but has since nearly doubled, mainly because of the use of phylloxera-resistant stocks. The principal vine-growing area surrounds Rutherglen, where there is a viticultural station; a nursery for the propagation of resistant stocks, where half a million vines are grafted yearly, is situated at Wahgunyah a few miles away. Another important area, including the famous St. Hubert and Lilydale vineyards, lies east of Melbourne. Rutherglen wines are remarkable for their body and their alcoholic strength, and include several good sweet and liqueur types; Lilydale wines are of the Bordeaux type. At Mildura on the lower Murray table-grapes and raisin-grapes are extensively grown.

In South Australia the progress of the industry was steadier and has encountered no setbacks, the climate discouraging fungoid diseases. Government assistance has usually taken the form of expert advice. A phylloxera act passed in 1900 has hitherto safeguarded growers [illegible] in the casual introduction of the pest; it is administered by a board of two officials and six elected growers' representatives, which levies a rate on growers and wine-makers and undertakes a systematic inspection of vineyards. The chief grape-growing district is situated between Angaston 50 miles north of Adelaide and Reynella about 15 miles south of it, where John Reynell planted cuttings from William Macarthur's vines and made the first South Australian wine. A rapidly extending vine-district lies along the Murray near the Victorian border. As in the other States, the grapes of the Murray valley produce full-bodied and sweet wines; those grown near the sea light and dry wines.

The collections of vines introduced in the early years were dispersed, and the names of the original stocks lost, so that many old and valuable types are now cloaked under purely local appellations. Some varieties are known by a different name in each State, others vary even from one district to another. Thus the Persian 'syrah' has been corrupted into Shiraz, and—because it was introduced from the Hermitage vineyard in France—is also locally known as Hermitage and Red Hermitage. Spanish Palomino is known as Sweetwater; Semillon appears as Hunter River; Ugni Blanc is known as White Shiraz, and Doradillo as Late Sherry. The varieties useless to commerce have been eliminated by unconscious selection. Those of proved merit have adapted themselves to the change of

climate and still impress their characters upon the wines of Australia. Of the dark varieties cultivated the chief are Shiraz, Mataro, Grenache, Carbernet, Pinot Noir, and Malbeck; white varieties include Riessling, Palomino, Semillon, Ugni Blanc, Pedro Ximenes, Verdelho, Tokay, and Doradillo.

Wine Manufacture.—In 1803-4 a small quantity of poor wine was made near Sydney, and King reported that the industry would prove unprofitable. By 1823, however, Gregory Blaxland (q.v.) had succeeded in making good wine at Brush Farm on the Parramatta from South African stocks, and was awarded medals for his wines by the Royal Society of Arts in England. James King's wines were the next to secure European recognition, and South Australian wines were praised at the Paris exhibition of 1854. At the Melbourne exhibition of 1881 the then emperor of Germany presented a trophy worth £800 'to an exhibitor of one of the Australian colonies as an acknowledgment of the efforts in promoting Art and Industry shown by the high qualities of the goods manufactured by such exhibitor.' This clumsily named but markedly important trophy was won by the wines of the St. Hubert vineyard.

Before wine-making was scientifically organized the warmth of the Australian climate (making it difficult to keep light wines and favouring a high proportion of sugar in the ripe grape), and the Australian inclination to sweet articles of diet, caused vignerons to pay attention chiefly to the heavier and more easily treated classes of wine; thus Australian wines of the average type gained a reputation for over-strength. In recent years the more delicate classes of dry wines, both red and white, have been assiduously studied. Roughly speaking, the Hunter valley wines are the lightest, the Murray valley wines the strongest and sweetest. Sparkling wines are being made in all three States, and are establishing their reputation in Australia at least; the long voyage does not improve this class of wine, so that neither Australian types sent to England nor European types sent to Australia maintain their original quality. 'Still' wines of Australian manufacture are becoming more and more valued in London, where for many years their reputation was endangered by the export of cheap and inferior types. Australians are not normally a wine-drinking people, although the best wines made are consumed locally, and the lower grades or bulk wines are exported.

The following figures illustrate the growth of the industry:—

Season.	N.S.W. acres	Vic. acres	Q. acres	S.A. acres	W.A. acres	C'w'th. acres
1860-1	1,584	1,138	—	3,180	335	6,237
1865-6	2,126	4,078	110	6,629	634	13,577
1870-1	4,504	5,466	416	6,131	710	17,227
1875-6	4,459	5,081	376	4,972	675	15,563
1880-1	4,800	4,980	739	4,337	659	15,515
1885-6	5,247	9,775	1483	5,142	624	22,271
1890-1	8,044	20,686	1981	9,535	1024	41,270
1895-6	7,519	30,275	2021	17,604	2217	59,636
1900-1	8,441	30,634	2019	20,158	3325	64,577
1905-6	8,754	26,402	2044	23,603	3541	64,344
1910-11	8,321	23,412	1634	22,952	2795	59,114
1915-16	7,883	22,353	1373	27,764	2751	62,124
1920-21	10,783	29,255	1256	36,661	3210	81,165

SEASON 1924-5.

	Vineyards. acres.	Wine. gallons.	Grapes. tons.	Raisins and currants. cwt.
New South Wales ..	10,954	1,171,264	3,590	24,133
Victoria	31,723	1,368,765	2,672	471,943
Queensland	1,137	33,119	961	—
South Australia	43,361	10,502,381	1,156	248,831
Western Australia	4,139	223,761	2,069	20,529
Commonwealth	91,314	13,299,290	10,448	765,536

See *Problems of the Viticultural Industry* (Bulletin 28 of the Commonwealth Institute of Science and Industry). H.E.L.

Vitis, a genus of the family Vitaceae, consisting of woody climbers with insignificant flowers and succulent fruits, and extending over the warmer regions of the globe. Seventeen species are indigenous to Australia; 16 are eastern, with one (*V. angustissima*) confined to Western Australia. *V. opaca* (Burdekin Vine) produces a number of edible tubers weighing as much as 5-10 lb. They are eaten like watermelons, after long immersion in hot water; they have a somewhat pungent taste. Many other species of *Vitis* have similar water-storage organs. See NATIVE GRAPE.

Vlamingh, WILLEM DE. See AUSTRALIA, DISCOVERY OF.

Volunteer Forces. See MILITARY DEFENCE and NAVAL DEFENCE.

W

Wade, Sir Charles Gregory (1863-1922), born at Singleton in New South Wales on 26 January 1863 and educated at All Saints' College, Bathurst, The King's School, Parramatta, and Merton College, Oxford (B.A., 1885), during his university career played in the English Rugby fifteen for three years in succession. In 1886 he was called at the Inner Temple and, returning to Sydney, was admitted to the local bar. In 1903 he entered the assembly as member for Willoughby, and held the seat for the neighbouring constituency of Gordon from 1904 to 1917. In 1904 Joseph Carruthers, coming into office with a party of mostly untried men, made Wade his attorney-general, the post during those years of land scandals needing someone of unassailable honesty; in October 1907 Wade succeeded Carruthers as premier, and for three years of turmoil led opportunist colleagues and a difficult house through industrial troubles and unwelcome social reforms with a stubborn straightforwardness which gained him respect while it alienated affection. From 1910 he displayed the same quality in opposition. In 1916, when negotiations for a Labour-Liberal coalition were in progress, Wade stood aside, and on 30 March 1917 became agent-general. In March 1920 he returned to Sydney to become a puisne judge of the supreme court. He died suddenly on 26 September 1922. Among the measures for which he was responsible there stands out the initiation of the Burrinjuck-Yanco irrigation scheme. (Kt. Bach., 1918; K.C.M.G., 1920.)

Waders, a name in general use for birds of the order Charadriiformes, which includes plovers, sandpipers, snipe, curlews, etc. Forty-seven species of this order occur regularly in Australia, and several others have been seen occasionally. Twenty-eight out of the 47 species breed in the northern hemisphere, and visit Australia during summer; 18 are resident forms, of which all but one are peculiar to the Australian region; and one, the Double-banded Dotterel (*Charadrius bicinctus*), breeds in New Zealand and regularly visits the Australian coast.

The waders are divided into a number of families, most of which are represented in Australia. Of the Charadriidae the best-known visiting form is the Eastern Golden Plover (*Pluvialis dominicus*), a shore-bird much sought by sportsmen; the resident species comprise three small forms known as dotterels, the little Red-capped Dotterel (*Charadrius ruficapillus*) being everywhere abundant on sandy beaches, and the Black-fronted Dotterel (*C. melanops*), a common frequenter of the shores of lakes and streams.

The Vanellidae are represented in Australia by four species. The largest is the Spurwing Plover (*Lobibyx novae-hollandiae*), common in swampy localities throughout south-eastern Australia and Tasmania. Another member of this family is the Black-breasted Plover (*Zonifer tricolor*), found throughout Australia and Tasmania in open country. The clearing of forest land for the cultivation of wheat has led to a great increase in the numbers of this species in many coastal regions where it was formerly almost unknown.

Of the oyster-catchers (Haematopodidae) two species occur on Australian coasts, the Pied Oyster-catcher (*Haematopus ostralegus*), which frequents sandy beaches, and the Black Oyster-catcher (*H. unicolor*), which prefers rocks. These birds are usually known to fishermen as redbills. Dampier in 1699 met with the former in Shark Bay, and gave a figure of it in his book. Its range extends from Australia to Europe.

The only member of the Arenariidae is the Turnstone (*Arenaria interpres*), which is a regular summer visitor to Australian coasts.

The Recurvirostridae include three very long-legged birds which are found wading in swamps throughout Australia. Two of these, which have straight bills, are known as stilts; the third, with an upcurved bill, is called avocet. The commonest is the White-headed Stilt (*Himantopus leucocephalus*), whose note is like the yelping of a small dog. The handsomer Banded Stilt (*Cladorhynchus leucocephalus*) is at certain seasons abundant on the salt lakes of Rottnest Island off Western Australia, and is locally known as the Rottnest snipe. The Red-necked Avocet (*Recurvirostra novae-hollandiae*) is of interest because it was the first endemic bird to be figured; a picture of it appears in Dampier's *Voyage to New Holland in 1699*, with the note that 'The head and greatest part of ye neck of this bird is red, and therein differs from the Avosetta of Italy.'

Red-necked Avocet (*length* 15½ *in.*).

The Scolopacidae include the birds known as sandpipers, knots, stints, snipe, etc., all of which breed in the northern hemisphere, while many

are familiar summer visitors to Australia. The largest member of the family is the Sea-curlew (*Numenius cyanopus*), which has a very long curved bill. This species was noted on the west coast of the Cape York Peninsula by Carstenszoon in 1623, and at Shark Bay by Dampier in 1699. The Australian Snipe (*Gallinago hardwicki*) breeds in Japan, and migrates—via Formosa and the Malay islands—to eastern Australia and Tasmania, where it arrives in August, remaining on the swamps till about the end of March.

The Australian Painted Snipe (*Rostratula australis*) is the only representative of the Rostratulidae, a small family found also in South America, South Africa, and southern Asia. It is a handsomely-marked bird, and frequents swampy localities, chiefly in the drier regions of the interior.

Painted Snipe (*length* 9½ *in.*).

The pratincoles (Glareolidae) are represented in Australia by two species, one of which, the Oriental Pratincole (*Glareola maldivarum*), is a visitor to northern Australia, breeding in Siberia. It has a forked tail and, like a swallow, pursues insects on the wing; it often associates in large flocks. An anomalous wader, peculiar to Australia, which is perhaps related to the pratincoles, is the Australian Dotterel (*Peltohyas australis*), a species confined to the arid inland districts. It is a somewhat snipe-like bird, with long legs, the plumage mottled with brown, chestnut, and buff, with black patches on the head and neck. This coloration makes it very difficult to distinguish the bird among stones on the gibber plains.

Lotus-bird (*length* 8 *in.*).

The Jacana or Lotus-bird (*Irediparra gallinacea*) is the sole Australian representative of the Jacanidae, small plovers remarkable for the immense development of their toes—which are so long that they are able to walk on floating water-plants. The jacana occurs on swamps throughout northern and north-eastern Australia. It lays very remarkable eggs of a rich brown colour, marked all over with scrawly lines of black, and with a highly polished surface.

The last family of waders represented in Australia is that of the stone-plovers (Burhinidae) of which there are two species. The Long-billed Stone-plover (*Orthorhamphus magnirostris*) is confined to the coasts of northern Australia and Malaysia; but the second species (*Burhinus magnirostris*), found throughout Australia, is commonly called the 'curlew,' though this name in England is used for a very different bird of the genus *Numenius*, closely allied to the sea-curlew mentioned above. The name 'curlew' is in both cases derived from the bird's call. The melancholy and mysterious notes of the Australian bird are among the most familiar nocturnal sounds of the bush. The bird is large, mottled brown and white, with long legs and exceptionally large black eyes, and inhabits open forest country. It lays its two eggs on the bare ground, without making any nest. It is very shy, usually seen slinking among bushes or taking to flight at a safe distance; owing to this wariness, it is one of the few large native birds that seem to be surviving the settlement of the country.

Stone-plover ('curlew').
(*length* 20½ *in.*)

W.B.A.

Wagtail, Willy. See FLYCATCHERS.

Wagtail, Yellow. See LARKS AND PIPITS.

Wainewright, THOMAS GRIFFITHS (1794-1852), born at Chiswick near London in 1794, lost his parents at an early age and was brought up by his mother's father Ralph Griffiths, publisher of the *Monthly Review*. He was educated at a school kept by Charles Burney, the classicist, whose valuable library (classical and theatrical) was bought for the British Museum, and whose brother James sailed with Cook on his second and third voyages; his sister Frances (Madame D'Arblay) was the author of *Evelina*. Griffiths and Burney secured for young Wainewright the *entrée* to the best literary and artistic society of the day, but after a short apprenticeship to art in 1814 he obtained a commission first in the guards and then in a yeomanry regiment. Tiring of discipline, about 1820 he betook himself to journalism, contributing to *Blackwood's Magazine*, the *Foreign Review*, and the *London Magazine*—on the staff of the last he was the chief art critic, and Charles Lamb in 1823 described 'kind, light-hearted Wainewright' as the magazine's chief stay. From 1821 to 1825 he was an annual exhibitor at the Royal Academy, showing good water-colours and crayon drawings; his oils were inferior. His house was a rendezvous for literary and theatrical celebrities, including Macready and De Quincey, and—flamboyant dandy though he was—he won the esteem of worthies whom he afterwards proudly enumerated in a petition to Governor Eardley-Wilmot of Tasmania—'Flaxman, *Coleridge, Chas. Lamb*, Stothard, Rd. Westall, *De La Roche, Cornelius, Lawrence*, and the God of his worship, FUSELI.' In 1826, to obtain money for his extravagances, he forged the signatures of the trustees of his mother's estate; for the same reason in 1829 he poisoned his uncle, and in 1830 his mother-in-law, and his beautiful sister-in-law Helen Abercrombie, whose life he had insured for £3000 in each of six different companies. The companies refused to pay; Wainewright brought suit to recover the money; the cases went against him on the ground that misleading representations had been made. He fled to France, but in 1837 ventured back to hiding in London, was recognized by a Bow-street runner, arrested, tried for obtaining £2259 from the Bank of England by forgery, and transported to Tasmania for life. The charges of poisoning were never legally proved, but there seems little doubt about the three cases mentioned; he was also credited with poisoning several other persons, but there is no serious evidence for those charges. The story runs that, as he lay in Newgate, someone reproached him for poisoning Helen Abercrombie. 'Yes, it was an awful thing to do' he replied, 'but she had such thick ankles.' At Hobart he painted portraits (several of which are reproduced in *Art in Australia*, Series iii, No. 7), acted as dresser in the hospital, ate opium, and petted cats, of which he had always been fond. In May 1844 he petitioned for a ticket of leave, but was refused on the ground that it was 'contrary to Act of Parlt.;' he was, however, granted '3rd Class wages.' The petition is in the Mitchell Library at Sydney. He died, still a convict, of apoplexy in 1852.

Wakefield, EDWARD GIBBON (1796-1862), eldest son of the Edward Wakefield who was an authority on agriculture and a friend of James Mill, was born in London on 20 March 1796, educated at Westminster school and at Edinburgh high school (proving a recalcitrant pupil at each), and in 1814 attached to the household of the British envoy to Turin. In 1816 he ran away with an heiress (Miss Pattle) and married her without interference from the lord chancellor: but when, having been left a widower in 1820, he in 1826 repeated the elopement with a schoolgirl heiress, whom he married at Gretna Green, he was sentenced to three years' imprisonment in Newgate gaol for the crime of abduction. Wakefield was a man of undoubted ability, but before this time had lived an idle life engaged in desultory diplomatic work. During his imprisonment, however, he began to read and to think on the subject of colonization; he developed a theory of systematic colonization, and spent the rest of his life in the attempt to put his theory into practice. While in Newgate he wrote and published anonymously, in August-October 1829, eleven 'Letters from Sydney' in the London *Morning Chronicle*, and before the end of the year republished them in book form under the title *A Letter from Sydney*, appending to them an 'Outline of a System of Colonization' which he had had printed at the beginning of 1829 but had not then published. The book was anonymous, but 'edited by Robert Gouger,' one of Wakefield's most zealous associates in his colonizing campaigns. Its vivid style and apparent accuracy of detail deceived many into believing that it was the work of an Australian colonist. Its great importance, however, was that it contained an outline of his theory, which was afterwards expanded by him orally before several parliamentary committees and in the chief of his many other writings, *England and America* (1833), and *A View of the Art of Colonization* (1849).

His theory was three-sided—economic, social, and political. (1) He proposed that crown lands, when required for agriculture, should be sold at a 'sufficient price,' that is, one high enough to compel labourers to work for landowners until they had saved enough to buy land. In this way the scarcity of hired labour was to be overcome. For pastoral purposes he favoured short leases, renewable until the land was required for agriculture. The revenue obtained from land-sales was to be used in emigration. (2) 'The sufficient price' would induce capitalists to migrate and become landowners, since there would be no difficulty in finding labour to work the land. The emigration fund would be spent in paying the passages of labouring men and women carefully selected for their ability to succeed in a new country. The presence of these two classes would attract others, so that colonization would mean transplanting society and civilization from an old to a new country. (3) Colonists were to be granted not only representative but responsible government. Wakefield firmly held that this concession, far from being a step towards independence, was the only way of binding closely together mother-country and colonies.

By 1830 Wakefield had gathered round him a band of enthusiastic and influential converts to his theory. He now decided to act through associations of supporters, keeping himself well in the background, but directing and controlling all the policy; his past history, of course, compelled him to work in obscurity until his achievements in colonizing reform had removed

the stigma from his name. During 1830 his followers formed the National Colonization Society, which in the course of less than a year's existence set on foot two important experiments in colonization. The first was when in 1831 the British government, half convinced by their representations, established in Australia a pale imitation of the 'sufficient price'—a uniform system of selling crown lands by auction at a minimum price of 5s. per acre, the revenue from sales being in part used to bring from Great Britain selected free migrants. The minimum price was later raised more than once, and the plan was adhered to for many years. Its effect upon settlement may be measured by the fact that in ten years (1832-1842) over £950,000, obtained from land-sales, was spent in bringing more than 50,000 free settlers to New South Wales and Port Phillip. The second experiment was the initial impulse for the foundation, in 1836, of South Australia; in 1830 the idea took form, and from that date until 1836 Wakefield toiled unremittingly to have a colony founded on the basis provided by his theory. To this period belongs his *New British Province of South Australia* (1834; 2nd edition, 1835). Although the twin principles of land-sales and assisted emigration were conceded, his success was only partial; land speculation and mismanagement, both in Adelaide and in London, marred the colony's early days, and before long the British government had to come to its financial assistance. But when the early troubles were over, the colony's prosperity was assured.

During 1838 Wakefield visited Canada as an unofficial secretary to Lord Durham, whose report, although it owes nothing to Wakefield's pen, exactly expresses his ideas of colonial self-government. He returned to Canada in 1841, and again in 1843, when he played a minor part in Canadian politics.

In 1837, however, before his first visit to Canada, he was closely connected with the powerful parliamentary committee which so thoroughly condemned the Australian convict-system that the British government almost immediately ceased to transport convicts to New South Wales, and the total abolition of the system in eastern Australia became certain. In the same year he turned his attention to New Zealand as a field for British settlement. Once again he spent years of hard work in forming associations, getting together supporters and settlers, and seeking from the British government official permission for his projects. But the opposition of the missionary societies prevented this; wherefore in 1839 Wakefield, despairing of diplomacy, resorted to direct action by despatching the *Tory* to New Zealand with a small party to make preparations for settlement. This act forced the hands of the British government, and compelled them to annex New Zealand and to proclaim British sovereignty just in time to forestall the French. For some years Wakefield continued to look after the interests of the New Zealand Company in London; in 1849 he was instrumental in forming the Church of England settlement at Canterbury in New Zealand, and himself migrated there, reaching the colony in February 1853. After a brief but stormy career in local politics he retired into private life, and died at Wellington on 16 May 1862.

Wakefield's ability almost amounted to genius. He was dominated, too, in all his thought by an unselfish ideal of regenerating colonial policy. He was both thinker and man of action, for it was his constant aim to translate theory into practice—a proceeding which involved the control of men and affairs. Ambitious, courageous, persevering, and tenacious of will, he yet possessed defects which marred his success. Though his aims were unselfish, his means were often unscrupulous. His management of men and affairs often degenerated into mere scheming and wire-pulling. His sanguine temperament led him to make many mistakes and miscalculations, which played into the hands of his opponents. His over-suspicious nature led him to doubt the motives of many even of his friends, who became estranged from him. Despite all these defects, his claim to rank high among the builders of Greater Britain must be admitted. No other man in the 19th century left such an enduring mark upon British colonization. When he began his work, colonization was extremely unpopular, and, by the few who had devoted any thought to it, colonies were regarded as mere encumbrances of which Britain must soon relieve herself. Before Wakefield died, he had revived the old colonizing spirit of the British people. His chief sphere of action was in Australia and New Zealand, where he not only furnished both the inspiration and the motive force for new colonies, but did much to remove the two great obstacles to Australian development. One was distance, which made migration difficult; the other was the convict-system, which made migration unpopular. The first obstacle Wakefield surmounted by his 'golden bridge' of an emigration fund. The second disappeared when the transportation committee's report 'gave the unclean thing its death warrant.' So Australia became a predominantly free country before ever the lure of gold made his schemes unnecessary.

It is true that his theory was never put into practice as he would have wished; that, indeed, would have been fatal both to Australia and to the theory. He conceived it as a scientific theory, to be applied as a whole or not at all. Actually it was successful only because the proposal to sell land and to use the proceeds in selected migration was at the time a peculiarly useful and practical method of colonization. There is no doubt that it encouraged land speculation, and was better suited to a society of capitalistic landlords and landless workers, such as Wakefield was familiar with in England, than to a system of land-settlement by small freeholders. It would be wrong, however, to blame him or his theory for the many mistakes and scandals of Australian pastoral settlement. He never realized the importance to Australia of the pastoral industry; he never grasped the practical problems involved in dealing with pastoral lands; but the worst features of the Australian land problem appeared only when his system of short pastoral leases was abandoned and the notorious orders in council of 1847 were issued (see LAND LEGISLATION). His most enduring work, however, was his constant advocacy of responsible government—a policy which, enshrined in Lord Durham's report, was gradually accepted by the British government and people; and, once accepted, was in time applied to all British white colonies in temperate zones. This policy alone made possible in the late 19th and early 20th centuries the growth of free self-governing colonies into overseas dominions.

E. G. Wakefield was not the only member of his family to become noteworthy in the

history of Australia and New Zealand. His second brother, ARTHUR WAKEFIELD (1799-1843), became a captain in the navy, was in 1840 made an agent of the New Zealand Land Company, founded the settlement of Nelson in 1841, and in 1843 was killed during the fight with Maoris at Wairau. The third brother, DANIEL WAKEFIELD, drafted the South Australian Association's act of 1834. The fourth, WILLIAM HAYWARD WAKEFIELD (1803-1848), who had his share both in the elopement and in the imprisonment that so transformed the eldest Wakefield's career, became a successful soldier in the Portuguese, and later in the Spanish, army, attaining in the latter the rank of colonel. In 1839 he was chosen to lead the *Tory* expedition to New Zealand and to purchase land there for resale to intending colonists by the company. Essentially a man of action, he set about his task with characteristic energy, buying from the Maoris in a short time over 20 million acres (see NEW ZEALAND). These purchases, however, were not only invalid from the point of view of Maori tribal law, but were disallowed by the government of New South Wales and later by the British government; the company was allowed to keep only 283,000 acres. In spite of this, William Wakefield continued to act as agent for the company, and was extremely successful in the conduct of complex and difficult disputes which arose between it, the settlers, and the Maoris; he encountered, of course, much opposition and unpopularity, and had just succeeded in overcoming this when he died of apoplexy on 19 September 1848. The fifth brother, FELIX WAKEFIELD (1807-1875), educated as an engineer, was in early life superintendent of public works in Tasmania, but from 1847 especially interested himself in the Canterbury settlement; many of the plantations at Christchurch originated from seeds and cuttings brought out by him, and he also first imported the red deer, pheasants, etc. that now infest the province of Nelson. In 1854 he revisited England and served during the Crimean war as lieutenant-colonel commanding the army works corps, in which capacity he constructed the railway from Balaclava to Sebastopol. In 1862 he returned to New Zealand, and died at Sumner near Christchurch on 23 December 1875.

EDWARD JERNINGHAM WAKEFIELD (1820-1879), Gibbon Wakefield's only son, was born in London on 25 June 1820. He accompanied his father to Canada in 1838, and his uncle in the *Tory* to New Zealand in 1839. Returning to England at the end of 1844, he published during the next year *Adventures in New Zealand*, an interesting but of course biassed account of the early days of the settlement. In 1852 he accompanied his father to New Zealand and settled there, dying on 3 March 1879.

The literature of the Wakefield movement is copious. Probably the most useful books for the general reader are Garnett's *Life of Edward Gibbon Wakefield* (1897); R. C. Mills's *Colonization of Australia, 1829-42* (1915); A. Grenfell Price's *Foundation and Settlement of South Australia* (1924); W. P. Reeves's *Long White Cloud* (1898) and *State Experiments in Australia and New Zealand* (1902); and A. Siegfried's *Edward Gibbon Wakefield et sa Doctrine de la Colonisation Systématique* (1904). R.C.M.

Walker, GEORGE WASHINGTON (1800-1859), born in London on 19 March 1800, was the son of a Unitarian, and himself baptized as a Unitarian, confirmed by a bishop of the Church of England, and educated at a Methodist school. In 1827 he became a member of the Society of Friends, and in 1831 accompanied James Backhouse (q.v.) on a mission to Australasia, in the course of which they traversed the settled districts of Tasmania and New South Wales (then including Moreton Bay), besides visiting Norfolk Island, Adelaide, Kangaroo Island, Albany, and the Swan River settlement. After eight years' mission work in Australia, the Mauritius, and South Africa, Walker returned to Hobart, where he settled down as a draper. His honesty and altruism won him general respect and esteem, and Governor Denison consulted him on works of charity. In 1845 Walker founded the Hobart savings bank, and was manager of it at the time of his death on 1 February 1859. He was also a member of the board of education and of the council which directed the Hobart high school. T.D.

Walker, JAMES BACKHOUSE (1841-1899), son of G. W. Walker, was born at Hobart in 1841, educated there and at a Friends' school in York, England, and admitted as a barrister at Hobart in 1876. He was a successful lawyer and an active philantropist, but his life's work was done in the cause of higher education and in historical research. In the fight for the establishment of the university of Tasmania (1890) he, with George Clarke (q.v.) and others, took a most active part, and in the years of its very feeble infancy he nursed it assiduously. *Is the University Worth While?* was the title of one of his pamphlets, but he himself had no doubts about it. His researches into the early history of Tasmania, especially the voyages of Tasman and the beginnings of settlement in the island, are embodied in a still standard work, *Early Tasmania* (published posthumously in 1902), though fuller information than that accessible to him is now available. He died at Hobart on 4 November 1899. T.D.

Wallabies. See KANGAROOS AND WALLABIES.

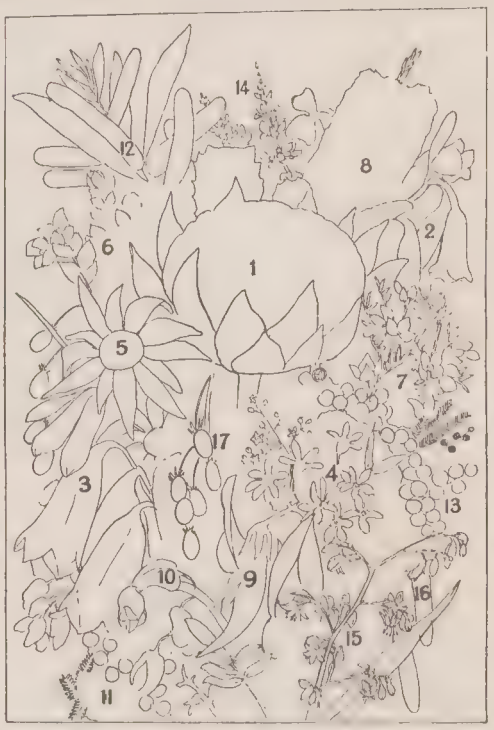
Wallace, WILLIAM VINCENT (1813-1865), born at Waterford in Ireland on 1 July 1813, was the son of a bandmaster of the Queen's Own regiment who in 1827 left the army and became leader of the orchestra of the Dublin Theatre Royal. In this William played the violin, and in June 1829 made his debut as a solo violinist in the concert-hall; he then became leader of the Hawkins-street theatre orchestra, in 1833 conducted the Dublin musical festival, and in 1834 played a violin concerto of his own composition. At intervals during these years he acted as organist of Thurles cathedral in Tipperary. In August 1835 he migrated to Australia to recruit his health, and devoted himself to sheep-farming; but while on a visit to Sydney he joined an amateur string quartette, gained the goodwill of Governor Bourke, and on 12 February 1836 gave a concert featuring one of his own compositions. Two other concerts (one in aid of St. Mary's cathedral) brought in £1000 each. He was for a time tutor to the families of Sir Alfred Stephen and Judge Josephson, and while in New South Wales composed most of the music for *Maritana*. Leaving Sydney in February 1838, he visited Tasmania and New Zealand, where he joined a whaling expedition whose Maori crew mutinied and killed all the Europeans except three. He visited India, Nepal, Kashmir, South America, and Mexico (where he gave many concerts and

composed a 'Grand Mass'), and then returned to London, where he made his debut as a pianist on 3 May 1845. *Maritana* was produced at Drury Lane on 15 November, and had a long and successful run; *Matilda of Hungary* followed in 1847, and he then visited Germany, where he wrote much pianoforte music. Overstrain followed, and made him almost blind, so he toured America, giving concerts, returned to England in 1853, and on 23 February 1860 produced *Lurline*. *The Amber Witch* was produced in 1861, *Love's Triumph* in 1862, and *The Desert Flower* in 1863. In 1865, after a serious illness in Paris, he was invalided to the Pyrenees, where he died at Bagen on 12 October 1865.

Waratah, the native and popular name of the genus *Telopea* (belonging to the family Proteaceae), which received its scientific name from the conspicuousness of its brilliant flowers among the foliage of the dry upper tablelands (*Telopea* = far-seen). 'The most magnificent plant which the prolific soil of New Holland affords is, by common consent both of

Telopea speciosissima.

Europeans and natives, the Waratah' wrote Sir J. E. Smith in 1793. In this genus the calyx is obsolete; petals united below into a tube opening on the under-side, upper portion divided into 4 broad, oblique lobes upon which the short anthers are seated; fruit a leathery follicle; seeds flat, winged. In the New South Wales representative, *T. speciosissima*, the brilliant crimson flowers are collected into a large globular head, surrounded by bracts of the same colour, and poised at the top of woody stems bearing stiff, alternate leaves, entire or toothed. On the sandstone hillsides in coastal or highland districts between the Hunter River and Braidwood the plant grows to a height of ten feet or more. Cultivated plants in suitable soil (e.g. in the northern suburbs of Sydney) will bear upwards of 50 of these flower-heads simultaneously. The flower is remarkably adapted to serve as a *motif* in wood or stone carving, or glass and pottery work, and has figured on the postage-stamps of New South Wales. A single flower-head may set from 12 to 20 pods of seed, which germinate freely; but the young plants are not easily grown to maturity. *T. oreades*, the Gippsland Waratah, a tree 30-40 feet high, with a diameter of 1-2 feet, extends



KEY TO PLATE XXVI.
FLOWERS OF EASTERN AUSTRALIA.

1. Waratah (*Telopea speciosissima*).
2. Christmas Bells (*Blandfordia nobilis*).
3. Christmas Bells (*B. flammea*).
4. Christmas Bush (*Ceratopetalum gummiferum*).
5. Flannel Flower (*Actinotus helianthi*).
6. Native Rose (*Boronia serrulata*).
7. Pink Boronia (*B. floribunda*).
8. Bottle-brush (*Callistemon lanceolata*).
9. Sturt's Desert Pea (*Clianthus Dampieri*).
10. Rock Lily (*Dendrobium speciosum*).
11. Cootamundra Wattle (*Acacia Baileyana*).
12. Sydney Golden Wattle (*A. longifolia*).
13. Wattle (*A. decurrens*).
14. *Hardenbergia retusa* ('Kongan' of Cooktown and 'Ru' of Batavia River).
15. *Dianella Tasmanica* (A Tasmanian Flax Lily).
16. *Piper Mestoni* (Meston's Pepper or Australian Pepper-vine).
17. *Delabrea Michieana.*

from Victoria into New South Wales as far as Moss Vale; it has a smaller flower than *T. speciosissima*, about 3 inches in diameter. *T. truncata* is the Tasmanian representative; its flower-heads are smaller still, and more loosely composed than in the other species.

Warblers, small perching birds belonging to the family Sylviidae. Members of this family are very numerous throughout the old world; but its limits are difficult to define, as some forms connect up with thrushes (Turdidae) and others with flycatchers (Muscicapidae), so that some Australian birds now generally regarded as warblers have been included by various authors in one or other of these families. Besides those mentioned below, Australian wrens, scrub-wrens, bristle-birds, and tits are usually

included in the family; these are dealt with in separate articles. Excluding these, the warblers found in Australia are all dull-coloured, brownish birds with rather long tails, frequenting bushes, grass-tussocks, or reed-beds; and some of them are true to the name of the family, being among the best Australian song-birds.

Pre-eminent among these is the Reed-warbler (*Acrocephalus australis*), which ranks very high among the indigenous songsters. Its loud and beautiful notes, following one another in rapid succession, may be heard throughout the summer in almost every reed-bed along the borders of our rivers and swamps; but the bird, which creeps about among the reeds in search of insects, is rarely seen. The nest, a very deep cup built of dried reeds and lined with grass, is attached to several reeds. At least in the southern portions of the continent the bird is migratory, retiring northward for the winter. The genus *Acrocephalus*, to which the reed-warbler belongs, is represented throughout the old world. Another Australian representative of a widespread genus is the Grass-warbler (*Cisticola exilis*), which is found all over Australia and extends to India and Formosa. It

Speckled Warbler (*length* 5 *in.*).

is a tiny bird with a pleasing but feeble song, often uttered on the wing; it rises in the air, sweeps round with fan-like tail widely spread (singing all the time), and then suddenly drops back to the swampy grass-flats which it frequents.

The grass-birds (*Megalurus*) are represented from India to Tasmania, two species occurring within Australian limits. The Little Grass-bird (*M. gramineus*) is found in southern Australia and Tasmania; it frequents samphire-swamps and reed beds, and constantly utters a most melancholy little song or call. The Desert-bird (*Eremiornis carteri*) is an inhabitant of the arid coastal regions of north-western Australia. The Rock-warbler (*Origma rubricata*) has also a very restricted range, being the only bird of its genus entirely confined to New South Wales. It frequents the rocky beds of creeks and gullies along the coast and in the Blue Mountains, and builds a large globular nest of moss and roots lined with feathers, attached to the roof of a cave or overhanging rock. The Little Field-lark or Speckled Warbler (*Chthonicola sagittata*), another Australian member of the family, is the sole member of its genus. It is confined to south-eastern Australia, frequenting open glades in forest country, and generally seen in small parties of four or five individuals hopping about on the ground. It builds a domed nest on the ground beneath a tussock, and lays eggs unlike those of any other Australian bird except the black-eared cuckoo, bright chocolate-red in colour.

W.B.A.

Warburton, Peter Egerton (1813-1889), born at Northwich in Cheshire on 15 August 1813 and educated in France, joined the navy at 12 and transferred to the army at 16 (ensign, 1831; lieutenant, 1837; captain, 1845; major, 1853), serving in India—where he was in 1835-7 adjutant to the marine battalion at Bombay—and later on in England as acting deputy-adjutant-general. He retired in 1853 to settle in New Zealand, but changed his mind, came to Adelaide in September of that year, and in December was made commissioner of police for South Australia. Resigning in 1867, he commanded the local volunteers from 1869 to 1877, then took charge of the imperial pensions establishment at Adelaide, and died there on 16 December 1889. His police duties took him far afield in the then little-known 'back-blocks,' and in 1857-8 he investigated the area west of Lake Torrens; in 1873-4 he was commissioned by Thomas Elder and Walter Hughes to explore the country between Central Mount Stuart in South Australia and Perth in Western Australia, but crossed the continent from Alice Springs to the Oakover River (see Exploration by Land). Unfortunately lack of expert knowledge led him always to undervalue the inland tracts, which he saw under drought conditions and could not envisage in good seasons. In 1875 he visited England to arrange for the publication of his book, *A Journey Across the Western Interior of Australia* (London, 1875).

Ward, Ebenezer (1837-1917), born on 4 September 1837 at Mersea Island in Essex, and educated at Dumpton Hall in Kent, in 1849 went to London and began his career in a printing office. He afterwards became a reporter on the *Morning Post*, but resigned in 1856 and sailed for Australia in March 1859. On arrival in Melbourne, he was employed by the Melbourne *Herald*. In 1860 he accompanied G. V. Brooke (q.v.) to Adelaide, and appeared for a time at the Old Victoria Theatre. On return to Melbourne he worked for the *Age* till June 1861, then went back to Adelaide to lead the Hansard staff, and wrote articles on the vineyards and orchards of South Australia which were afterwards published in book form. In 1863 he joined the Adelaide *Daily Telegraph* as assistant-editor, and in the following year was appointed clerk to Finniss's Northern Territory expedition, with which he remained till 1865; he afterwards rejoined the *Telegraph*. In 1868 he stood for Gumeracha, but was defeated; in 1870 he won the seat, and held it for ten years, during which he was minister of education and agriculture in one of the Boucaut administrations and in the Colton ministry. In 1880 he resigned his seat, but sat for the Burra in 1881-4; after the subdivision of this electorate in 1884 the Frome district returned him, and from 1884 to 1890 he was chairman of committees. In 1890 he was defeated for Frome, but in 1891 was returned by the Northern District to the legislative council.

In 1870-1 he was instrumental in stopping the sale of crown lands for cash and in throwing open the lands on credit selections; he advocated railway extension and introduced the education act of 1875. With Sir Henry Ayers he represented the colony at the eighth intercolonial conference in Sydney in 1877. Upon retirement he went to Perth, where he died on 8 October 1917.

A.D.A.

Ward, Sir Edward Wolstenholme (1823-1890), born on 17 August 1823, entered the

royal engineers in 1841 (captain, 1852; major and lieutenant-colonel, 1864; colonel, 1869; major-general, 1877). In May 1855 he was appointed first deputy-master of the branch of the royal mint established in Sydney (see CURRENCY), and lived at Dawes Battery for many years. In 1869 he was transferred to Melbourne as first deputy-master of the royal mint there, which was formally opened in June 1872. He retired from the service in 1876, returned to Europe, lived many years at Cannes and London, and died on 5 February 1890. (C.M.G., 1874; K.C.M.G., 1879.)

Wardell, ROBERT (1793-1834)—of whose early life nothing is known except that he was trained for the law and obtained at some university the degree of LL.D.—was in 1819 a barrister and editor of a London evening newspaper, *The Statesman*. In that year he met William Charles Wentworth (just then called to the English bar) and in 1823 planned with him to establish a rival newspaper to the *Sydney Gazette* at Sydney (where, it was rumoured, censorship of the press was about to be abolished along with other remnants of the early autocracy). Wardell sold his interest in the *Statesman* for £3000, invested the amount in type, paper, etc., for his new venture, and with Wentworth left England for Sydney, which he reached in July 1824. In September the two were admitted to practice as barristers in the new supreme court, and on 14 October the first issue of *The Australian* appeared without official permission. Brisbane took legal advice, discovered that under the charter of justice (which had been promulgated on 17 May) he could not interfere with the paper unless the matter had been first submitted to the legislative council, and decided to 'try the experiment of the full latitude of the freedom of the press.' He reckoned the experiment a success, and his successor Darling for some time favoured the *Australian* and even quarrelled with Saxe Bannister (his attorney-general) over Wardell's merits. When, however, the newspaper took up the grievances of Sudds and Thompson (see DARLING, SIR R.) the governor's opinion altered, and he denounced Wardell as 'without principle, and will write just as it answers his purpose;' and when he espoused the emancipist cause and attacked Darling's proposal to tax the press, Wardell became in the governor's eyes almost a criminal, and was for some time pursued with libel actions. The most famous was tried on 29 September 1827; Wardell, who had implicitly called the governor 'ignorant and obstinate' in his paper, conducted his own defence and persuaded the jury to disagree. Darling accounted for this and other defeats in the law courts by alleging that Wentworth and Wardell 'keep the Court and the Bar by their effrontery and talent equally in subjection.'

Wardell was in those days a busy man. Wentworth had sold him his share of the *Australian*, and he both edited and managed it; he practised assiduously, being one of the most sought-after barristers in Sydney; he ran a farm on the Cook's River slope of Petersham; and found time withal to fight a duel (in April 1827) with Colonel Dumaresq, Darling's private secretary—three shots on each side left both combatants unscathed, and Wardell then at Wentworth's urgent request assured Dumaresq that nothing personal had been intended by the paragraph to which exception had been taken.

In 1828 Darling was rebuked by the colonial office for his treatment of Wardell, and thenceforth relations became more amicable between them, Wardell being even employed as counsel for the government in several cases, and by Darling's own admission saving his client a good deal of money. When Bourke in 1831 became governor, the *Australian* mended its manners and settled down to moderate criticism, and Wardell might have become a staunch conservative in his old age had he not on 8 September 1834 gone a-riding over his Petersham farm. There in the bush he discovered a hut which three convict absconders had erected; always impatient of trespassers, he rode at them to force their surrender, and one of them shot him down. The murderer was convicted in November and hanged.

Warehou. See TREVALLY.

Warrigal, see DINGO. The word is also applied metaphorically to wild horses (properly called 'brumbies'), to wild aboriginal tribes, and occasionally to outlawed blackfellows. The early variant spellings, warragal, worregal, etc., have died out.

Wasps, vernacular name of insects belonging to two large groups of the order Hymenoptera (q.v.), Vespoidea and Sphecoidea. In the group Vespoidea modern authors recognize about 26 families, and nearly 1000 species have been described from Australia. The largest groups are the Thynnidae (flower-wasps) with more than 400 species, the Mutillidae (solitary ants) with about 200, the Eumenidae (solitary wasps) with 160, and the sand-wasps (Psammocharidae or Pompiliidae) with 100. Various species are figured on plate xix.

Flower-wasps are among the most striking elements of the Australian insect-fauna; they may be seen, particularly in the spring, visiting in hundreds the flowers of tea-tree, eucalypts, and *Angophora*, the males frequently carrying the wingless females about with them. Many species are exceedingly beautiful, and they have been much studied and admired; yet so far we do not know the complete life-history of a single species. *Thynnus pulchralis* (fig. 31), *Zaspi'othynnus vernalis* (fig. 32), and the well-known Blue-ant (*Diamma bico'or*, fig. 33) are illustrated, the first two being shown paired as they visit flowers, and the last as a solitary female, the male being rarely found.

Solitary ants (Mutillidae) also have wingless females, but these are larger than the males; and the latter do not visit flowers, as do the Thynnidae, but prefer to hunt rapidly over tree-trunks or along the ground. Most Australian species belong to the genus *Ephutomorpha*; *E. sanguiniceps* is fig. 34.

The Chrysididae (ruby wasps) are well represented, though few of our species have so far been described. They are beautiful metallic insects, whose larvae are parasitic in the nests of mason-wasps. Our best-known species are *Stilbum splendidum* (fig. 35) and *Pentachrysis imperiosus*, both strikingly beautiful.

The large Scoliidae visit flowers, like the Thynnidae, but are hairier and more thick-set, and the females are winged instead of wingless. About 50 Australian species are known. *Discolia soror* is the common metallic-purplish-black species found near Sydney; the allied *Sco'ia frontalis* (fig. 36) comes from southern Queensland.

The Masaridae (shining wasps) are represented in Australia by just over 20 species, of

which *Euparagia deceptor* is the best-known. They have a deceptive resemblance to the true social wasps (Vespidae), but do not live in communities.

The Psammocharidae (sand-wasps), perhaps better known as Pompiliidae, are abundant in Australia. They may often be seen hunting for spiders, which they paralyse and store up in their nests as food for their larvae. Most of the genera—for instance, *Salius*, *Pseudagenia*, and *Psammochares*—are widely spread; *Salius bicolor*, *Calopompilius defensor* and *Batozonus tricolor* are three fairly common large wasps with orange-and-black coloration.

Among the social wasps the Vespidae are poorly represented in Australia by about 20 species; by far the commonest is *Polistes variabilis*, whose beautiful paper nest is a common object in gardens as well as in the bush. The solitary wasps (Eumenidae), on the other hand, are abundant; the beautiful *Abispa ephippium* and the very graceful *Eumenes arcuatus* are figs. 37 and 38. They are also known as mason-wasps or mud-daubers, from their habit of building clay nests in sheltered situations; the larvae are fed on caterpillars.

The group Sphecoidea, considered by some entomologists as a single large family (Crabronidae), is more usually divided into some 15 families, of which only the more important can be mentioned here. More than 350 Australian species are known.

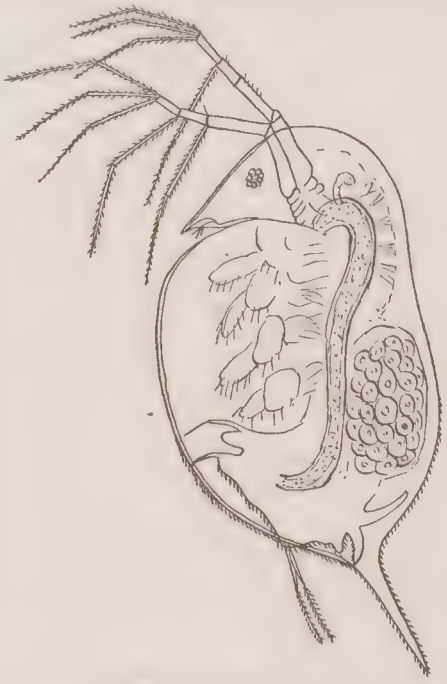
The Sphecidae are represented here by the world-wide genus *Sphex* (=*Ammophila*) and by the handsome wasps of the genus *Chlorion* and its allies. *Sceliphron laetum* (fig. 39) is a beautiful insect with a slender waist. These wasps, like the Eumenidae, build nests of clay, but the larvae are fed on spiders. The 'policeman-flies' of inland districts are active wasps of the families Nyssonidae, Arpactidae, and Stizidae. They owe their name to their habit of capturing flies in the open, with which to feed their larvae. *Sericophorus relucens* is an active, bee-like insect with coppery markings. Other species have been described belonging to the genera *Arpactus* (=*Gorytes*), *Nysson*, and *Stizus*. The Philanthidae are represented by a number of species of the peculiar genus *Cerceris*, which are strongly attracted by the sweet secretions of scale-insects. The Crabronidae and Bembecidae are both represented by their type-genera *Crabro* and *Bembex*, and by other handsome genera. Few Australian species of either family have been described.

The Trypoxylidae and Larridae are also represented here by their type-genera *Trypoxylon* and *Larra*, as well as by a number of other genera; the commonest forms are Trypoxylids of the genus *Pison*, black wasps well known for their habit of entering houses and filling up keyholes and other interstices with their small clay nests. A less-known family is the Exeiridae (cicada-hunters). The Great Cicada-hunter (*Exeirus lateritius*, fig. 40) is one of our largest and handsomest wasps. These wasps make large sand-mounds, with a number of openings leading to subterranean passages; they bring home captured cicadas, which they first paralyse, afterwards pushing or 'riding' them direct to the mound, often for a distance of more than a hundred yards, and over almost insurmountable obstacles. The larvae feed on the cicada, and, when once safely in the cocoon, may live for several years during a dry cycle, only pupating when the season is favourable. This accounts for the sporadic occurrence of these insects. See HYMENOPTERA. R.J.T.

Water Conservation. See IRRIGATION AND WATER CONSERVATION.

Water-fleas, the popular name of certain small aquatic crustaceans (such as *Daphnia* among Cladocera, *Cypris* among Ostracoda, and *Cyclops* among Copepoda), all included in the division Entomostraca of the class Crustacea. The name is usually applied to freshwater species, but similar forms, especially among the Copepoda, are abundant in the sea.

In *Daphnia* the body is enclosed in a bivalve shell. The head, which is only partially distinct from the body, bears a large single eye and a pair of large antennae that form the chief swimming-organ; the body has several pairs of leaf-like appendages, also used for swimming. Daphnids are very prolific, increasing during the summer by parthenogenetic eggs hatched out in a dorsal brood-chamber between the shell and the back; towards the end of summer special 'winter-eggs' are produced, which require fertilization. These become covered with a thick envelope, and are capable of being dried without losing vitality, hatching out in the spring of the next or of a subsequent year. Many other water-fleas produce similar eggs. Dried mud from Australia containing these eggs has been sent to Europe, and the animals hatched out and described by G. O. Sars of Norway and other observers.

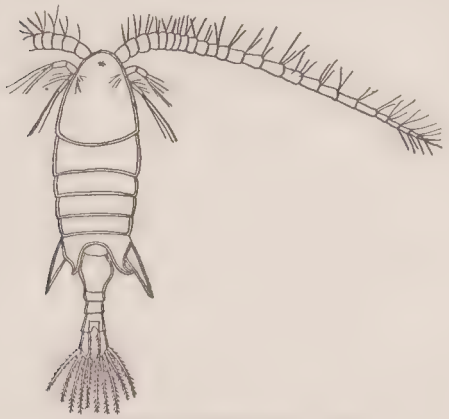


Daphnia thomsoni, x 18.

In the Ostracoda (e.g. *Cypris*) the bivalve shell is better developed, and encloses the head as well as the body. In many cases these shells are calcareous and capable of being preserved as fossils, thus affording important palaeontological evidence of the age of the strata in which they are found.

The Copepoda (e.g. *Cyclops*) have the body more distinctly segmented. The shell is not bi-

valve. The head bears the antennae, mandibles, and maxillae, and the first five segments of the body have swimming appendages; the posterior portion is narrowed, and forked at the end, which bears long hairs forming a tail-fin. *Boeckella*, a genus of freshwater copepods of larger size than *Cyclops*, includes several species which occur in Australia, Tasmania, New Zealand, South America, the Falkland Islands, and other sub-antarctic lands. A similar genus, *Diaptomus*, is widely distributed in the northern hemisphere. There are many marine copepods, some of them pelagic (i.e. living in the open sea near the surface), and so beautiful in form and colouring that they have been called 'the butterflies of the ocean.' Many copepods are parasitic on fish, and have the body much modified accordingly. These pelagic copepods and other 'water-fleas' may occur in enormous numbers, forming a prominent part of the plankton and an important food-supply of fish and other animals.



Boeckella triarticulata, x 20.

See Brady on the Ostracoda in the *Report on the Voyage of the 'Challenger,'* vol. i (1880), and on the Copepoda in vol. viii (1883); Sars's *Crustacea of Norway*, vols. iv and v (1901-3); Wilson's numerous reports on parasitic Copepoda in the *Proceedings* of the United States National Museum (1902 onwards); and Marguerite Henry on the freshwater Entomostraca of New South Wales in the *Proceedings* of the Linnean Society of New South Wales, vols. 47-49 (1922-4).

C.C.

Water Gums. See TRISTANIA.

Waterhouse, GEORGE MARSDEN (1824-1906), born at Penzance in Cornwall on 6 April 1824, was educated at the Methodist college at Kingswood near Bristol, came to Hobart with his parents in 1839, and was employed for some years in a merchant's office. In 1843 he commenced business on his own account at Adelaide. Entering politics in 1851, he represented East Torrens in the legislative council until 1854, and was elected by the same constituency to the assembly of 1857, but only sat for one session. In 1860 he was elected to the legislative council, and in October 1861 formed a ministry which broke up in nine days; he then formed from the remains of his predecessor's cabinet a second ministry which lasted nearly two years. Ousted from office in 1863 by Francis Dutton, Waterhouse in 1864 migrated to New Zealand, and in 1870 was nominated to the New Zealand legislative council. For a short time in 1871 he joined the third Fox ministry, and on 11 October 1872 formed a ministry of his own, thus becoming the only man who has held the premiership of two Australasian colonies. He resigned in March 1873, finding himself merely a nominal head-piece for the impulsive and dominating Julius Vogel. In 1880 he went to England, and died at Torquay on 6 August 1906.

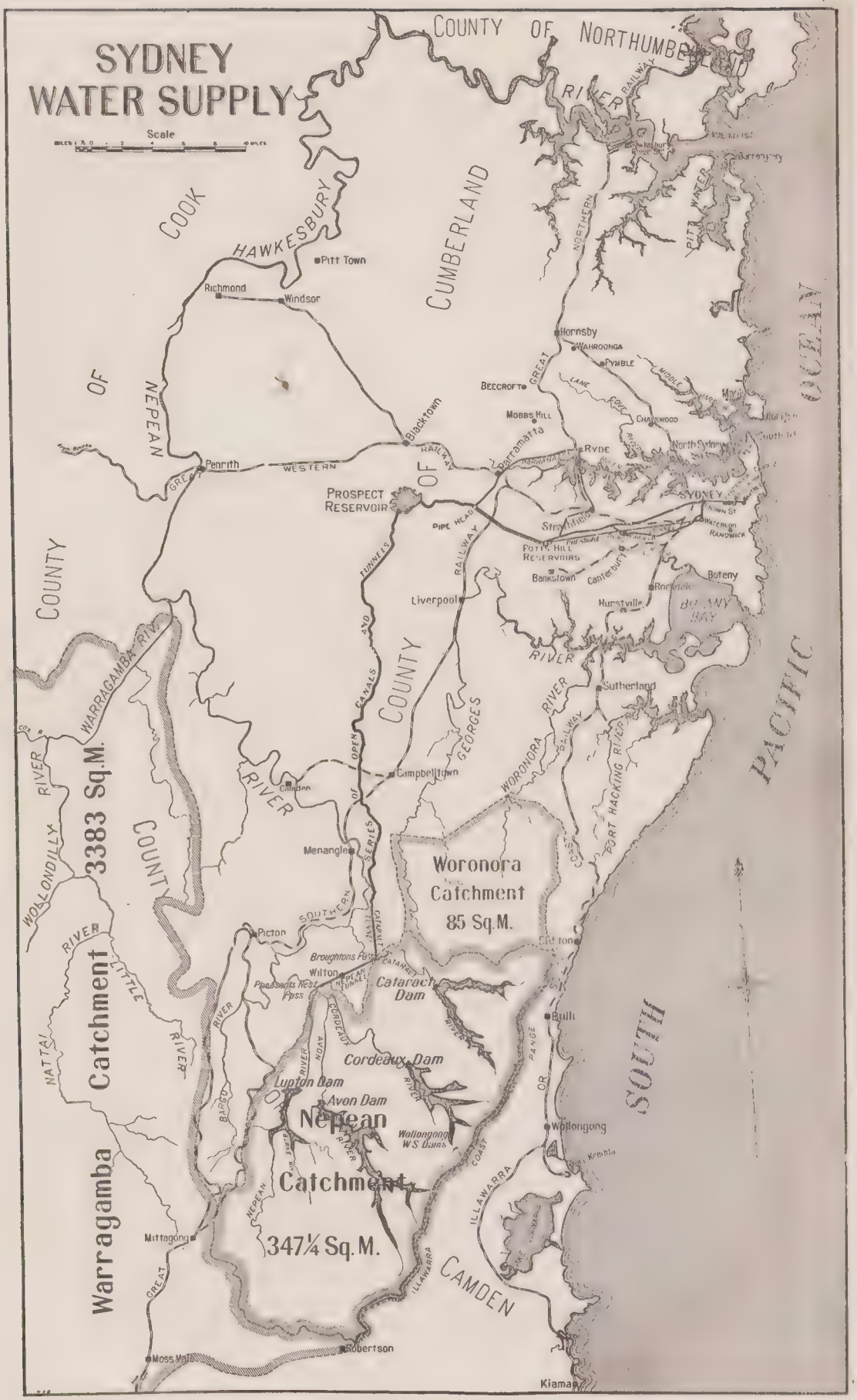
T.G.

Water Hyacinth. See NOXIOUS PLANTS.

Water-lily, the popular name of a genus of the family Nymphaeaceae, consisting of aquatic plants with a world-wide distribution. The principal Australian species, *Nymphaea gigantea* (Gigantic or Blue Water-lily), which is endemic in Australia, has ornamental leaves about 18 inches across, orbicular in outline, with a heart-shaped base, attached to the stalk by the centre; flowers of various shades of blue to almost white, a foot in diameter. It ranges from the northern rivers of New South Wales through Queensland into northern Australia, and the Queensland aborigines use its starchy tubers (and in the inland districts its seeds) as a food. In 1852 tubers were sent from Wide Bay in Queensland to England and successfully grown there under artificial heat; the large flowers attracted much attention. The leaf-stalks have been used as breathing-pipes by aborigines when forced to take to the water to escape from enemies.

Water-rats. See RODENTS.

Water-supply and Sewerage. *New South Wales.* The site of Sydney was chosen for the first British settlement in Australia because of the 'clear running stream of fresh water' that traversed it. In 1791 tanks holding about 8000 gallons were excavated in the bed of this stream, which was thenceforth known as 'the Tank Stream;' wells were also sunk along its course. In time of drought water was occasionally brought from the stream that ran through Blackwattle Swamp into Darling Harbour, and transports were ordered to water at 'a convenient place upon the north shore.' In 1795-9 Hunter repeatedly complained that the water-supply was being wilfully polluted, and in 1803 the tanks were so choked with sand that H.M.S. *Glatton* had to send a party three miles inland to fill her water-casks. In 1810 Macquarie, with his usual thoroughness, had stone walls built along the banks of the stream, pulled down the slaughterhouses and other objectionable buildings that drained into it, and enforced his predecessors' prohibition against washing clothes or watering stock in it. A succession of wet seasons solved the problem during the rest of Macquarie's term, but by 1824 the supply was again deficient, water had to be fetched from 'stagnant waterholes' in Blackwattle Swamp, and John Busby (q.v.) was sent from England to devise a satisfactory scheme. Under his supervision water was brought through a tunnel ('Busby's bore') from the Lachlan swamp (behind the present agricultural showground) to Hyde Park, where it was delivered to carts from a standpipe. This remained Sydney's only supply until the 1850s, when the city council—under authority given it in 1850 by the legislative council to construct water and sewerage works—placed a series of dams on the Lachlan and other swamps draining towards Botany Bay; a pumping-station was erected near the bay, and in 1858 water was pumped to, and delivered by gravitation from, a reservoir at Crown-street; a second reservoir was constructed at Padding-


SYDNEY
WATER SUPPLY
Scale
COUNTY OF NORTHUMBERLAND
COUNTY OF COOK
COUNTY OF CUMBERLAND
COUNTY OF CAMDEN
HAWKESBURY RIVER
NEPEAN RIVER
GREAT WESTERN RAILWAY
GREAT SOUTHERN RAILWAY
PACIFIC OCEAN
SOUTH
Pitt Town
Richmond
Windsor
Hornsby
WAHROONGA
FYMBLE
BEECROFT
MOBBS HILL
CHATSWOOD
Blacktown
Parramatta
RYDE
North Sydney
SYDNEY
Penrith
PROSPECT RESERVOIR
PIPE HEAD
Strathfield
POTTS HILL RESERVOIRS
Bankstown
Canterbury
Botany
Rockdale
Liverpool
Hurstville
TUNNELS AND OPEN CANALS
Sutherland
WARRAGAMBA RIVER
WOLLONDILLY RIVER
NATTAI RIVER
COUNTY OF GEORGES
WORONORA RIVER
PORT HACKING RIVER
Campbelltown
Camden
Menangle
Picton
Broughtons Pass
Wilton
Pheasants Nest Pass
Cataract Dam
Cordeaux Dam
Lupton Dam
Avon Dam
Nepean
Wollongong W.S. Dams
Bulli
Wollongong
Kembla
Mittagong
Moss Vale
Robertson
Kiama
3383 Sq.M.
Warragamba Catchment
347¼ Sq.M.
Nepean Catchment
Woronora Catchment 85 Sq.M.

ton in 1864, and a third at Woollahra in 1880.

By this time the demand for water was fast outgrowing the supply obtainable from the Botany swamps, and after a great deal of discussion the 'upper Nepean' scheme was adopted. Early in the 1880s construction work was started by the harbours and rivers branch of the public works department; the first water from the Nepean was delivered to Botany by temporary fluming in January 1886, and the main supply (to Crown-street reservoir) was in use in the following November.

The Nepean catchment lies south of Sydney between 34° and 35° S. lat., approximately upon an east-west line marking the southern limit of the northern summer monsoonal rainfall control and the northern limit of the southern winter (Antarctic) control. The area of the catchment above the points of off-take is 347 square miles, and the average rainfall over the whole area approximately 48 inches per annum. The formation is almost entirely Hawkesbury sandstone, covered for the most part with eucalypt forest interspersed with areas of swamp and bare rock. The area is drained by the Nepean River itself and its tributaries the Cataract, Cordeaux, Avon, Burke, and London; the water is of exceptional purity and good colour, and is used for domestic purposes without either mechanical filtration or chemical treatment. Water from the catchment is conveyed to Sydney through a system of tunnels and canals to the Prospect reservoir. The water is diverted from the Nepean at Pheasants Nest Pass into the 'Nepean tunnel,' which is 4½ miles in length, with a capacity of 97 million gallons per day, and terminates at Broughton's Pass on the Cataract River: from Broughton's Pass the 'Cataract tunnel,' 1¾ miles in length, with a capacity of 150 million gallons per day, conveys water from the Nepean tunnel and the Cataract River into canals and tunnels with a total length of about 14½ miles to Prospect, where a reservoir formed by an earthen dam across the Prospect Creek has a gross storage capacity of 11,029 million gallons—of which 5502 million gallons are available for use by gravitation. The volume of water which can be thus drawn from the Nepean catchment is limited to 150 million gallons per day (the capacity of the Cataract tunnel), and the construction of storage reservoirs on the Nepean and its major tributaries became necessary. The Cataract dam was completed and came into use in 1906; the Cordeaux dam was completed in 1926, and the completion of the Avon dam is looked for about the end of the same year—both the Avon and Cordeaux dams, however, became effective for storage purposes in 1925. Work upon the Nepean (Lupton) dam was started in 1925, and its completion is looked for in 1930.

	Catchment. (sq. miles)	Contents. (gallons)	Greatest height of dam. (feet)	Length of top of dam. (feet)
Cataract	50	20,743,000,000	154	806
Cordeaux	35	20,600,000,000	182	1298
Avon	55	47,000,000,000	220	741
Nepean	123	11,500,000,000	219	500

These dams are constructed of cyclopean masonry formed of blocks of Hawkesbury sandstone, weighing up to 10 tons, embedded in concrete with a water-face of bluestone concrete.

It is estimated that on the completion of the Nepean reservoir the Nepean catchment will be capable of supplying to Prospect 100 million gallons per day through a period of rainfall as low as any yet recorded. If the regulating effect of the Prospect reservoir be added, 110 million gallons per day are assured. This volume of water, however, falls far short of the future estimated requirements of Sydney and its suburbs, and recourse to other catchment areas will be necessary. A catchment area of 100 square miles, with rainfall somewhat similar to that of the Nepean catchment, is drained by the Woronora and George's rivers and Stokes and O'Hare's creeks; 83 square miles of this area have been reserved, and works for its development are in course of design. A far more important source of supply is now under consideration known as the Warragamba scheme. The Warragamba River joins the Nepean about 12 miles above Penrith, and a dam approximately 300 feet in height in a rocky gorge near the junction would impound 155,200 million gallons of water. The catchment area is 3383 square miles, drained by the Wollondilly, Cox, and other tributaries of the Warragamba. The average rainfall is 31 inches per annum. The Warragamba reservoir would supply 200 million gallons per day through a period of extremely low rainfall.

From Prospect reservoir the water is conveyed by a 5-mile canal to Pipe-head, 16½ miles from Sydney; there it is screened, and thence taken by three 6-foot mains to balance reservoirs (150 million and 108 million gallons) at Potts Hill, 5 miles away; three other mains take water to a pumping-station at Ryde for the use of the northern suburbs. From Potts Hill, Sydney and its eastern and western suburbs are supplied partly by gravitation, partly from service reservoirs on the eastern heights, which are filled by pumping from Crown-street. Additional mains are being laid and larger service reservoirs constructed; further, a pressure tunnel which will deliver 100 million gallons a day is under construction from Potts Hill to Waterloo.

In 1888 the waterworks and sewers previously controlled by the Sydney city council were handed over to a 'metropolitan board of water-supply and sewerage' which included representatives of the city and suburban councils. The board's finances, however, were placed under direct government control, all revenue being paid into the colonial treasury and all expenditure voted by parliament. An amending act of 1924 created (on 31 March 1925) a metropolitan water, sewerage, and drainage board, with 17 members chosen by the municipalities and shires within the board's sphere and a chairman appointed by the government. This board has full control of finance and power to raise loans.

On 30 June 1925 services under the board's control (including supplies to Richmond on the Hawkesbury and to certain South Coast towns) comprised 3324 miles of mains supplying 1,313,180 persons; the consumption of water for the 12 months then ending totalled 19,990 million gallons, the average daily consumption being 57,355,000 gallons—44.15 gallons per head. The maximum daily consumption, reached during the summer of 1926, was over 99 million gallons. The capital cost of the system on 30 June 1925 was about £14,750,000. Revenue is raised by a general rate and by a charge of 1s. per 1000 gallons (1s. 6d. at Richmond and on the South Coast) on water supplied through a meter, against which the amount of the rate may be set off. E.M.de B.

Sydney Sewerage.—The physical features of

the coast-line near Sydney favour the discharge of sewage into the ocean; projecting headlands, with cliff-faces having deep water at their bases, washed by currents which carry any flocculent matter clear of the embayed portions of the coast, were available for the outfalls of the main sewers. Along the coast and for some distance inland the rock is Hawkesbury sandstone, and most of the main sewers are concrete-lined rock-tunnels.

The metropolitan district is split from east to west by Port Jackson and the Parramatta River. The southern area is divided for sewerage purposes into three districts. The main sewer serving the northern district has since 1886 discharged into the ocean at Ben Buckler headland near Bondi; two other large outlet sewers, serving the southern and western districts, originally fed a sewage farm on a sandy tract of land fronting Botany Bay and Cook's River, but since 1910 this sewage has been discharged into the ocean at the headland near Long Bay. Two coastal municipalities, Vaucluse and Randwick, have their own main sewers discharging into the ocean.

North Sydney and Mosman, on the northern shores of Port Jackson, were in 1892 connected with treatment works at Willoughby Bay in Middle Harbour, but the rapid growth of settlement north of the harbour made it necessary to design a comprehensive system for the whole area. A main sewer is therefore being constructed from an ocean headland on the quarantine ground at the North Head of Port Jackson to Parramatta about 20 miles away. This will intercept the sewage of North Sydney and Mosman, and the treatment works will then be dismantled; it will also provide an ocean outlet for the sewage of all the intermediate suburbs north of the Parramatta River, and of Granville, Auburn, and Lidcombe on the south—an area of nearly 187 square miles. At Clontarf in Middle Harbour, where the channel is 1000 feet wide with a maximum depth at low water of 78 feet, this sewer consists of two parallel reinforced-concrete pipes of 6 feet internal diameter, laid along the bed of the harbour on piled concrete foundations.

On 30 June 1925 the total capital expenditure upon Sydney's sewerage was £9,472,000, the population served 853,870, and the total length of main and reticulation sewers about 1358 miles. A.P.

Country Towns.—Since 1880 the public works department has been authorized (under the country towns water-supply and sewerage act of 1880 and the local government act of 1919), to construct upon application by local authorities, waterworks and sewerage systems in towns and country districts; these, when completed, are handed over to local control, the cost being repaid in instalments over a period not exceeding 100 years. The works for the Newcastle district, which cost £2,730,000, are controlled by the Hunter district water-supply and sewerage board, constituted under an act of 1892; in June 1924 water was supplied to a population of 147,840. On 30 June 1924 waterworks in 63 other towns, costing in all £1,730,000, had been handed over (except at Junee and Grafton) to the local councils. The water-supply of Broken Hill, on which loan expenditure to the amount of £481,795 was incurred up to June 1924, was constructed under a special act and is administered by the minister for public works; owing to the failure of the supply during the summer of 1925-6 provision was made for the cartage of water by rail to Broken Hill, and proposals for a more extensive permanent scheme are now under consideration. A few municipalities have constructed waterworks out of their own resources. By 30 June 1924 sewerage and storm-water-drainage works had been completed in 20 country muncipalities of New South Wales. Their total cost, advanced by the government, was £537,069, repayable by the municipalities benefited in annual instalments of £24,143. Newcastle sewerage works, including 166 miles of sewer and costing in all £610,849, are controlled by the Hunter District Water-supply and Sewerage Board; the loss on them in 1921 was £14,420, but had decreased in 1924 to £2788. Any country municipality may apply to have such works constructed by the public works department, taking over control on completion and repaying the cost in instalments.

Victoria.—Melbourne was first supplied with water by means of tanks and water-carts filled from the Yarra River above the falls. In 1850 a small steam-engine was erected to pump water to a tank in Flinders-street, from which carts distributed it. In 1853 a commissioner of sewers and water-supply was appointed, and work was begun on the Yan Yean reservoir, from which the first water was turned on in 1857. In June 1891 the water-supply system was taken over by the Melbourne and metropolitan board of works, created under an act of 1890 primarily to provide a sewerage system for the metropolis. The area under the board's control covers 434 square miles, and in 1924 included the whole or parts of 37 municipalities.

The Yan Yean system, still the main source of supply, originates in two creeks (Silvery and Wallaby) running through unsettled country north of the main divide near Mount Disappointment; their water is taken across the divide by an aqueduct into a branch of the south-flowing Plenty River and stored in the 1360-acre Yan Yean reservoir, which holds nearly 6500 million gallons; it discharges to a pipe-head reservoir at Morang and thence to the main metropolitan storage reservoir at Preston. A second source is the Maroondah River, a tributary of the Yarra, whose waters are carried by a 41-mile aqueduct to Preston. The eastern suburbs (which lie high) are provided for both by a direct high-level main from Yan Yean and by a reservoir at Mitcham, to which the waters of the O'Shanassy River (another tributary of the Yarra) are brought by a 49-mile aqueduct. The Maroondah and O'Shanassy supplies have hitherto been diverted by weirs, but on both rivers dams are in course of construction which will greatly increase the stored water. On 30 June 1925 the services under the board's control comprised 2101 miles of mains supplying 954,558 persons; the average daily consumption was 55,633,000 gallons—58.28 gallons per head; the capital cost of the system was £6,504,316. As the board has been since its creation in full control of its finances, it has acquired surpluses, available for further expenditure on the system, which in 1924 amounted to £4,635,869, or more than three-quarters of the total capital cost.

Melbourne Sewerage.—For the year 1894 in the metropolis of Melbourne, with an area of 85,502 acres, the removal of night-soil by the movable pan system cost about £90,000. In August 1897 there began to be substituted the water-carriage system under the Melbourne and metropolitan board of works, and the greater

part of the then scheme had been carried out by the end of 1920 for 90,821 acres. On 14 December of that year the area under the board's control was extended to be the land within 13 miles radius of the general post-office. This amounted to 277,760 acres, and on 30 June 1925 comprised 38 municipalities or part-municipalities, 22 being represented by 39 commissioners on the board, but the rest not yet so represented.

Extended work in laying mains, branches, reticulation sewers, etc., is now (1926) proceeding. In 25 of the above 38 municipalities there were 191,318 houses, with an estimated population of 847,538, for which sewers were provided on 30 June 1925. Drains from such houses were, or were being, connected with the vast ramifications of sewers in the different districts. In all there were 484 reticulation areas, with over 5000 reticulation extensions in working order. The interconnected lengths of 4-in., 6-in., and 9-in. house-connections, pipe-branches, and reticulation-pipe sewers are further connected with 116 branches, an intercepting sewer, a relieving sewer, and a scour main. These are again connected with 14 sub-mains and mains, and the whole ultimately drains into two chief mains—the North Yarra and the Hobson's Bay. These principal arteries gradually collect the sewage in the two great systems—the northern and the southern. The North Yarra main commences (18-inch) at Heidelberg, and then takes in Kew (part of), Northcote, Preston, Coburg, Brunswick, Collingwood, also Fitzroy and the North Carlton, North Melbourne, Flemington, and Kensington parts of Melbourne together with Essendon and Footscray. It terminates as an 8-ft. 6-in. sewer at the pumping-station, Spotswood. The Hobson's Bay main starts (18-inch) at Sandringham and then picks up Brighton, Moorabbin (part of), Oakleigh, Caulfield, Malvern, St. Kilda, Blackburn and Mitcham (part of), Nunawading, Camberwell, Kew (part of), Hawthorn, Prahran, Richmond, Melbourne city, South and Port Melbourne. After passing under the Yarra it receives the sewage from Williamstown, and terminates at Spotswood as a 9-ft. sewer. In all, 179 miles of main and branch sewers and 1720 miles of reticulation and house-connection have been completed. When the sewage is collected at Spotswood, it is raised 125 feet to the outfall sewer at Brooklyn through rising mains, two of 6-ft. diameter and one of 4-ft. These run side by side for 2¾ miles, two being in actual use and the other kept as a stand-by. There are also two 6-ft. by-pass rising mains of about 14 chains laid north and south of the pumping-station. By these the sewage can be by-passed outside the buildings, to permit of cleansing and repairing operations. From Brooklyn the sewage gravitates to the metropolitan sewage farm at Werribee, by a channel about 16 miles long and 11 feet in diameter, built of concrete or concrete lined with brick, part open and part closed. The grade is 2 feet to the mile, and its present maximum capacity, limited to half-full conditions, is 12,500 cubic feet per minute, or 112,500,000 gallons per day. The normal daily flow is about 36,000,000 gallons.

The farm is situated in the shire of Werribee about 24 miles south-west of Melbourne and 4 miles south-west of the township. With its eastern boundary at the Werribee River and its northern at the Geelong-road, it has about 6 miles frontage to Port Phillip Bay. The land slopes from north to south, the highest point being about 65 feet above low-water mark. The point of delivery being at 37.25 feet, to irrigate the portion above that level necessitates pumping. The farm area is 13,603 acres. Purification is effected by filtration and aeration through the natural soil, the sewage being applied to the land by broad irrigation. The land required for these purposes is divided into 20-acre blocks (20 chains by 10), graded into bays of about half an acre each and commanded by distributing drains to facilitate rapid flooding. The sewage is distributed by main carriers running parallel north and south half a mile apart, with sub-carriers branching east and west at every 10 chains. The filtered sewage is discharged into the Bay by a series of main channels, running parallel north and south. Each of the hundreds of paddocks is supplied with water from Melbourne through a main which also feeds a storage reservoir of 2,600,000 gallons capacity, to ensure uninterrupted supply. Provence lucerne is grown for hay and grazing, and the pasture grasses are chiefly English rye and prairie grass. In some paddocks the indigenous barley-grass grows luxuriantly, and clovers of various kinds are spreading rapidly in the older pastures. Considerable areas have also at times been put under maize.

Breeding herds of about 3000 cows (Shorthorn, Hereford, and Polled Angus) are maintained, and large numbers of store bullocks are fattened. There are also about 2000 Romney ewes, bred to pure Romney rams. Altogether there are grazed on the 8084 acres of irrigated pastures up to 8000 cattle, 17,000 sheep, and 1000 horses. Generally the revenue more than covers the expense of sewage purification, apart from interest on capital, and occasionally in drought years it covers the interest also. For ten years the average net cost per annum (including interest) has been 5.42d. per head of persons served. The farm is thus claimed to be one of the least expensive and most efficient sewage-purification systems in the world. The following is an analysis of cost of sewerage construction to 30 June 1925:—

House connections	551,606
Reticulation	4,989,039
Main and branch sewers	2,362,313
Pumping-station, buildings, and engines	282,718
Rising mains and outfall sewer	448,821
Farm purchase and preparation	695,727
Night-soil sites	34,631
	£9,364,855

The limit of the dry weather flow for the present outfall sewer to the farm is from a population of 1,100,000 persons. The board contemplates providing for 1,187,605 in 1935, 2,373,186 in 1958, and 3,922,688 in 1975. The cost will prevent the question of carrying the whole of the future sewage to the Werribee farm from being solved by enlargement or duplication of present sewers. It will be necessary, therefore, to supplement and relieve the Werribee system as population increases.

The Geelong water-supply has a catchment area of about 16,000 acres, with reservoirs storing about 2710 million gallons. The population supplied is about 38,000. The works are controlled by a trust representing the areas supplied. The sewerage system (also under the trust) consists of a main outfall sewer to the ocean at Black Rock (about 9 miles from Geelong) and over 90 miles of reticulation mains. At Bendigo the sewerage is controlled by the city council. Most country waterworks are controlled by a State rivers and water-supply com-

mission, but 99 are vested in local trusts and 29 in municipal corporations.

South Australia.—Adelaide's first water-supply was distributed by carts from the River Torrens; later, a weir was thrown across the river at the Gorge, and the water diverted to a reservoir at Thorndon Park, passed through filter-beds, and supplied to the town through mains. A second reservoir was constructed north of the river at Hope Valley, and a third subsequently at Happy Valley 10 miles south of Adelaide, which drew water from the catchment area of the Onkaparinga River. In 1919 a fourth reservoir was completed at Millbrook on the upper Torrens, east of the Mount Lofty range. On 30 June 1925 these four had an aggregate capacity of nearly 8000 million gallons, and through 1108 miles of mains served 111,872 acres, the annual consumption being about 7000 million gallons. The total capital cost to that date was £3,166,087. The Adelaide sewerage system, which was begun in the early eighties, includes a sewage-farm, filter-beds, and an outlet-channel to the North Arm. On 30 June 1925 there were 424 miles of sewers in the main system; Glenelg and adjacent suburbs are served by separate works, including a pumping-station, septic tank, lucerne plots, and filter-beds.

Over 100 South Australian country townships—including Gawler, Wallaroo, Moonta, Kadina, Port Pirie, Port Wakefield, Balaklava, Tanunda, and Cowell—are supplied with water for domestic purposes and the use of stock from reservoirs with an aggregate capacity of nearly 9000 million gallons at Barossa, Beetaloo, Bundaleer, Warren, and Yeldulknie; 18,071 square miles of country are reticulated with 3600 miles of mains. A reservoir on the Tod River, west of Tumby Bay in Eyre's Peninsula, supplies Port Lincoln and the peninsula's farmlands, the trunk main being laid for 129 miles towards Denial Bay. Four towns on Encounter Bay—Goolwa, Middleton, Port Elliot, and Victor Harbour—share a reservoir in the hills immediately behind them. All South Australian water and sewerage works are controlled by the State's public works department.

Queensland.—In 1859 the just-established municipal council of Brisbane took control of the chain of waterholes near the railway yards from which the town's water-supply had previously been drawn; water was carted at first by the council and later by licensed carriers. In 1866 an area of 13 square miles on the upper part of Enoggera Creek was reserved for catchment, and a reservoir holding about 1000 million gallons was constructed 8 miles west of Brisbane. In 1885 a second reservoir, holding 406 million gallons, was constructed on Gold Creek south of the Enoggera catchment. But the city's requirements soon outran these supplies, and in 1892 a pumping-station was established at Mount Crosby, on the Brisbane River north of Ipswich, which can if necessary pump 6000 million gallons a day into a reservoir 463 feet above low-water mark at Brisbane. The Mount Crosby reservoir supplies 90 per cent of Brisbane's water. The controlling authority up to 1910 was a board of officials and aldermen; from 1910 onwards a metropolitan water and sewerage board, consisting of eight elected representatives of the districts concerned, with a chairman appointed by the government. In 1925 the consumption was 4703 million gallons, the maximum day's record being 20 million gallons, the length of mains 810 miles, and the capital expenditure £3,520,000. The whole of the water for the metropolitan area is filtered.

The Brisbane sewerage system is designed to include the cities of Brisbane and South Brisbane, the towns of Hamilton, Windsor, Ithaca, and Toowong, the shire of Coorparoo, and portions of the shires of Stephens, Taringa, Balmoral, and Toombul. A main sewer, 5 feet in diameter, discharges into a pump-shaft at Pinkenba, 11 miles from Brisbane, where the sewage is screened, raised 60 feet by electrically-driven centrifugal pumps, and discharged into a high-level sewer whence it gravitates to another pump-shaft three miles away; it is then treated by sedimentation—a method soon to be replaced by the 'activated sludge' method. It next gravitates to an outfall sewer, which discharges into the Brisbane River. Twenty and a half miles of main sewers, and 70 miles of reticulation, were completed at the end of 1925.

At the end of 1923 32 country towns in Queensland had water-supplies, constructed by municipalities chiefly from government loans.

Western Australia.—Until the early 1880s the water-supply of Perth was obtained from private wells and tanks, and from two public springs; some water was then pumped from wells at the foot of Mount Eliza into a service reservoir, but no provision for a permanent supply was made until 1889, when the municipal council entered into an agreement with a private company for the construction of waterworks. These, which included the Queen Victoria reservoir (capacity 200 million gallons) on Mundy's Brook in the Darling Ranges, a 12-inch trunk main from the reservoir to Mount Eliza (17 miles), and a 784,000-gallon service reservoir on Mount Eliza, were begun in February 1890, and water was supplied to Perth in October 1891. In 1896 the government purchased the works and vested control of them in a board. In 1897 an artesian bore was sunk in Wellington-street; in 1899 both the Leederville and Subiaco councils put their bores under the board's control; a fourth bore was sunk at the Causeway in 1901. In 1904 the minister of works took over control of the system, administering it through a board; in 1910 a metropolitan water-supply, sewerage, and drainage department was established with authority over the Perth, Fremantle, and Clermont supplies; in 1913 the Guildford district was included, and in 1914 Armadale. The metropolitan supply is now obtained from Bickley Brook and Lower Bickley Brook (a single source), Mundaring reservoir (used chiefly to supply Midland Junction and Guildford), 13 bores (the main source of supply), and the Armadale Pipe-head dam. In 1924 water was supplied to a population estimated at 189,053; the length of mains was 700 miles. A dam is under construction at Churchman's Brook, and plans are in hand for storage reservoirs on the Wungong Brook and Canning River.

The Perth sewerage system, begun in 1906, consists of 4 septic tanks of reinforced concrete on the southern slopes of Claisebrook; the effluent then passes by a 22-inch main (which forms a syphon under the Swan River) to 10 percolating filter-beds at Burswood Island. From the low-level area along the foreshores of Swan River sewage is pumped to the treatment works. The Fremantle sewerage is dealt with by septic tanks which finally discharge into comparatively deep water beyond Robb's Jetty. On

30 June 1924 15,023 houses were connected with sewers.

The goldfields water-supply scheme, a remarkable undertaking, was authorized by an act of 1896 which provided for an expenditure of £2,500,000; work was begun in 1898 under the supervision of C. Y. O'Connor (q.v.) and water was delivered in Kalgoorlie in January 1903. The water is stored in the Mundaring reservoir (4650 million gallons) on the Helena River in the Darling Ranges, 18 miles from Perth; thence it is pumped through a steel main of the locking-bar type (30 inches internal diameter) by a series of eight pumping-stations. Each of these—except No. 1, which draws direct from the reservoir—is provided with a suction-tank which receives the water pumped from the preceding station; the last station delivers it into a main service reservoir of 12 million gallons capacity, situated at Bulla Bulling, 1290 feet above the lowest off-take from the Helena reservoir. The total length is 307½ miles. The main follows the railway-line for the greater part of the way. The water is distributed from service reservoirs, and a considerable area of agricultural country is supplied by branch pipes. The length of mains on 30 June 1924 was 1303 miles; the total cost of the works was £3,487,887.

In addition to the above-mentioned systems, in 1922-3 13 towns were supplied with water by the department of works, the estimated population served being 13,464. Tanks, wells, and bores are provided for agricultural purposes and to meet the requirements of scattered mining communities. Experience has proved that, owing to the intense summer-heat, concrete linings to reservoirs are unsatisfactory, and since 1899 an asphalt composition has been brought into use. Tanks are roofed with corrugated iron to prevent evaporation. It has been found that a tank of one million gallons' capacity, roofed and lined with asphalt composition, is better than a galvanized unroofed tank of 6 million gallons' capacity, excavated in the best selected clay on the eastern goldfields; the lining stops absorption, and the roof saves 92 per cent of evaporation.

Owing to the vast unwatered distances over which stock is forced to travel in Western Australia, the government has established stock-routes provided every 10 or 12 miles with wells 6 ft. by 4 ft. varying in depth from 20 to 100 feet. The main routes are:—

1. Minginew to De Grey; 2. De Grey to Kimberley; 3. Leonora to Nullagine; 4. Day Dawn to Ashburton; 5. Williuna to East Kimberley; and 6. Coolgardie to Eucla. The distance and the well watering capacity of each is:

1.	830	miles	with	wells	to	water	mobs	of 300
2.	360	„	„	„	„	„	„	„ 300
3.	630	„	„	„	„	„	„	„ 400
4.	263	„	„	„	„	„	„	„ 400
5.	900	„	„	„	„	„	„	„ 600
6.	510	„	„	„	„	„	„	„ —

Tasmania.—In 1831 Hobart was supplied with water from the Hobart rivulet on Mount Wellington, an aqueduct being constructed, a line of cast-iron pipes laid down, and the water distributed to several points known as 'wells.' In 1860 the city council took over control of the works; additional streams flowing from Mount Wellington were acquired as sources of supply, and a storage reservoir holding 40,000,000 gallons was constructed. The catchment area was later extended to include the North-west Bay River, 15 miles from Hobart; it now includes about 4200 acres, and yields a remarkably pure supply. The headworks consist of a small weir across the North-west Bay River at a point about 12 miles from Hobart, 2074 feet above sea-level; cast-iron pipes bring the water from various mountain streams to a stone basin at the Bower (five miles from the city and 1500 feet above sea-level), whence it runs through a stone troughing for 2½ miles to the storage and distributing system. The whole of the supply is by gravitation. On 31 December 1924 the number of tenements supplied in the city and suburbs was 9958, serving a population of 46,100; the length of reticulation mains was 107 miles.

The construction of a sewerage system was begun in 1903 and practically completed by 1912; about 2000 acres are now covered. The sewage is discharged into the estuary of the Derwent River at Macquarie Point, in a strong current and deep water. Sewage from the area round the foreshores is lifted by three 'Shone' ejectors to the gravitation sewer. By 31 December 1924 76 miles of sewers had been laid in connection with the original city system and 1841 tenements connected; the municipalities of Queensborough and New Town, which have been included in the city area since the original scheme was adopted, are being separately sewered. Work was begun at Queensborough in 1913, and by December 1924 1019 tenements had been connected; the outfall is at One Tree Point, where a disintegrator has been installed to break up the solid matter before discharge into the Derwent estuary. New Town has been connected since 1921 with a sewerage discharging at Cemetery Point; by December 1924 345 properties were served.

Water-tree. See NEEDLE-WOOD.

Watsford, JOHN (1820-1907), born at Parramatta on 5 December 1820, was educated at The King's School under Robert Forrest, and for two years was on the teaching staff. His father owned and drove the first mail-coach in the colony—it ran between Parramatta and Sydney. In 1841 John was accepted for the Wesleyan-Methodist ministry—the first native-born youth to enter it—and was appointed assistant minister at Windsor, being transferred two years later to the mission-field in Fiji. Returning to Australia in 1853, he was appointed successively to the Sydney East, Goulburn, Maitland, Adelaide First, Adelaide Second, Ballarat, and Melbourne (Brunswick-street) circuits, serving three years in each except the last; soon after appointment to Brunswick-street he was made home mission secretary for Victoria, and held the post for eight years. He then returned to circuit work in Victoria, and in 1891 became supernumerary. In 1871 he was president of the Australian Conference, and in 1878 president of the General Conference of Australasia, and twice visited Tonga to investigate the misbehaviour of Shirley Baker. He died in Melbourne on 24 July 1907. See METHODISTS.

See his autobiography *Glorious Gospel Triumphs* (1900).

J.C.

Watson, JOHN CHRISTIAN, was born at Valparaiso, Chile, on 9 April 1867, and brought while still a child to New Zealand, educated at Oamaru public school, and apprenticed to the printing trade. In 1888 he came to Sydney to work as a compositor on the *Star* (now the *Sun*). He first came into prominence as president of the New South Wales labour conference which framed the famous pledge and formed the solid-

arity Labour party (see LABOUR PARTIES). In 1893-4 he was president of the Sydney trades and labour council and in the following year president of the Australian labour federation. In 1894 he was elected member for Young in the New South Wales legislative assembly. During the session of 1895 he was instrumental in amending the municipal act, which abolished plural voting by property-owners, and gave a vote to occupiers. In 1901 he was returned to the federal parliament for The Bland (which included his former state seat), was chosen leader of the Labour party in the house of representatives, and secured important modifications in the fiscal measures submitted by the Barton ministry. In April 1904, when the Deakin government was defeated over the conciliation and arbitration bill, Watson formed the first Commonwealth Labour ministry. The house met on the 21st and his first statement was 'a clear and manly' one. In it he announced his intention of taking up the arbitration bill which had brought about the crisis, and of establishing a tobacco monopoly in order to provide money for old-age pensions. He proposed to bring State employees within the scope of the arbitration bill and threatened to resign if it were rejected. In August he was defeated on that issue by a coalition between Deakin and Reid, and Governor-general Northcote refused him a dissolution. As leader of the opposition, he influenced the proceedings of the house to such an extent that Deakin was taunted with being led by him. In 1905 he assisted Deakin to put Reid out of office. In 1906 he was elected for South Sydney, and in the following year resigned the leadership of the party to Andrew Fisher (q.v.); his health having failed, he retired altogether in 1910. In the opinion of Sir George Reid 'no leader of the party before or since could hold a candle to him so far as tact and mental balance were concerned, and his abilities were all of the best sort for a political leader.'

J.V.C.-B.

Watson, JAMES HENRY, was born at Stonehouse in Devonshire on 2 December 1841, and educated at Plymouth grammar school. In 1863 he migrated to Melbourne; in 1869 he proceeded to India, where he joined the staff of the Great India Peninsula Railway Company, returning to Victoria four years later. Since 1880 he has lived in Sydney.

For nearly 11 years (1915-25) he was honorary research secretary of the Royal Australian Historical Society, and occupied the presidential chair in 1909 and again in 1926. In 1916 he was elected a fellow of the society, and in 1925 was presented with a life membership in recognition of his services. Since his retirement from business in 1909 all his leisure has been devoted to the study of Australian history, and he is the recognized authority on early shipping and church history. He at one time actively interested himself in military matters, and retired from the old 1st New South Wales infantry regiment in 1902 with the rank of captain.

K.R.C.

Wattle. See ACACIA.

Wattle-birds, perching birds (peculiar to Australia and Tasmania) belonging to the genera *Anthochaera* and *Acanthogenys*, members of the honey-eater family (Meliphagidae), q.v. The typical wattle-birds or gill-birds (*Anthochaera*) are characterized by the possession of fleshy wattles (or gills) at the corner of the beak; it is from this circumstance that they derive their name, not from any connection with wattle-trees (*Acacia*) as is sometimes supposed. They are the largest members of the honey-eater family, and in former times were shot in large numbers for the markets of Sydney, Melbourne, and Hobart—a practice not yet entirely abandoned, since they are regarded as delicacies. They are mottled, grayish-brown, noisy birds, with two tails tipped with white; they utter curious croaking and chuckling notes, and often congregate in large numbers to feed on the honey of banksia flowers. Of the three species of *Anthochaera* the Yellow Wattle-bird (*A. paradoxa*), whose yellow wattles are more than

Red Wattle-bird (*length* 14½ *in.*).

an inch long, is confined to Tasmania; the Red Wattle-bird (*A. carunculata*), with comparatively small, bright-red wattles, occurs in southern Australia; the Brush Wattle-bird (*A. chrysoptera*), the smallest species of the genus, which is found in eastern and southern Australia and Tasmania, has no wattles.

A near relative of the wattle-birds is the Spiny-cheeked Honey-eater (*Acanthogenys rufogularis*) which has a series of spiny white feathers on the cheeks. The throat and breast are rufous; otherwise it resembles the wattle-birds in coloration, and, like them, utters very curious notes. It is found throughout the greater part of Australia.

W.B.A.

Wattle Day. On 20 September 1889 the Adelaide branch of the Australian Natives' Association initiated a 'Wattle League,' which came into existence on 12 May 1890 with 61 members, and on 26 January 1891 took part in the ceremonies of Foundation Day. Enthusiasm soon died down, and in a few months the league ceased to exist. On 30 August 1909 the notion was revived by J. H. Maiden (q.v.) at a public meeting in Sydney, and 1 August 1910 was fixed as the first 'Wattle Day.' The

South Australian League was re-formed on 12 July 1910 and on 19 September 1911 began negotiations with the other States to federalize the movement. The Queensland branch was formed in 1912. In 1914 it established an art scholarship in London, but during the war its activities were directed towards the relief of wounded and distressed soldiers and sailors. In 1923 it reverted to its original purpose of encouraging the arts. The first pan-Australian conference of the league was held in Melbourne on 8 January 1913, and Wattle Day has since been observed all over Australia on 1 August or 1 September, according to the forwardness of the wattle-flowering in each State. The idea behind the day is the embodiment of Australian national sentiment in a native flower, and the setting apart of a day for its celebration.

Way, Sir Samuel James (1836-1916), was born at Portsmouth in England on 11 April 1836, and educated privately. His father, James Way, migrated to South Australia in 1850 and became the first pastor of the Bible Christian communities in Australia; and at Adelaide the son joined him in March 1853. Trained for the law, and admitted to the local bar in 1861, Way soon established a high reputation as a lawyer, and in 1871 became Q.C.; in 1874 he was made a member of the board of education and of the first council of the university of Adelaide, becoming vice-chancellor in 1876, and chancellor in 1883 and thenceforward until his death. In 1875 he began a short political career, being elected to the assembly for the Sturt district in February; he was made attorney-general in the Boucaut ministry in June, but resigned that post in March 1876 to succeed Sir R. D. Hanson (q.v.) as chief justice of the colony. In 1891 he was made lieutenant-governor of the colony, and as such administered the government seven times; in May 1897 he was sworn in a privy councillor, and took his seat on the judicial committee of the privy council as the first Australasian representative judge. Throughout a long judicial career he never had a decision reversed on appeal to England. Working to the last, he died without issue at Adelaide on 8 January 1916.

Way's career was by no means exclusively legal. His connection with the university has already been referred to; he was also president of the public library, museum, and art gallery from 1893 to 1908, and of the children's hospital from 1878 to his death, and in none of these positions was he merely ornamental or official. His services to education and culture were recognized by honorary degrees from several Australian, Canadian, and English universities (hon. D.C.L., Oxon., 1891; LL.D., Cantab., 1897). Further, he was a well-known sheep-breeder, with a merino stud at Mintaro established in 1878, and was the first to introduce to Australia the improved Shropshire sheep that are now the staple of the frozen-mutton trade. (P.C., 1897; baronet, 1899.)

Wealth, Public and Private. 'Wealth' as applied to a community, means different things to different writers. Some use the term to denote only the realized material wealth which at any given time is the property of the citizens in their individual capacities; others include the communal wealth represented by the material possessions of governments, general or local; others again go so far as to include the citizens themselves as a portion of the total wealth. Communal wealth, though more amenable to evaluation than the human element, is almost as hard to estimate, since the absence of a market deprives the calculation of a sound basis. National parks, botanical and zoological gardens, libraries, museums, harbours, docks, waterways, roads, streets, bridges, etc., form an important part of the wealth of a community, but cannot be satisfactorily valued. For government railways, their cost (with an allowance for depreciation) would for many purposes furnish a basis of valuation; but the fact that so many items of communal wealth are not amenable to any satisfactory treatment makes it necessary here to restrict the term 'wealth' to the realized material wealth which at a given time belongs to citizens in their individual capacities.

In Australia three methods of estimating private wealth have at various times been adopted: (1) the probate method, (2) the inventory method, (3) the census method. The *probate* method has been used in various forms for many years; the basis of the calculation is the value of the estates of deceased persons, and it is assumed that those dying in any given period constitute, in respect of their possessions, a fair sample of the population. If this assumption were correct, and if the records of their possessions when they died were available for all deceased persons, a simple sum in proportion would ascertain the private wealth of the living; unfortunately neither supposition is true. Even when the estates of deceased persons are classified according to their late owners' sex and age, and a separate multiplier is obtained for each item, the fact emerges that the deceased are not for such purposes a fair sample of the living—for in a very large number of cases estates pass *inter vivos* and are not recorded in the probate returns. If it were possible for all wealth so to pass, the estates of deceased persons would amount to nil. This is, of course, an extreme supposition, but the possibility indicates one of the serious weaknesses of the probate method.

By this method the government statist of Victoria estimated in 1911 that the private wealth of Australia was then £990,000,000. For the reasons just given this estimate is believed to be considerably below the truth. The figures for the several States were as follows:—New South Wales, £424,000,000; Victoria, £310,000,000; South Australia, £93,000,000; Queensland, £80,000,000; Western Australia, £48,000,000; Tasmania, £35,000,000. An estimate prepared by this method in 1915 by the then Commonwealth statistician, in connection with the war census of that year, indicated a total for the Commonwealth of £1,027,061,000—but the compiler expressed the opinion that the result considerably under-estimated the true position.

The inventory method of estimating the wealth of a community has been very largely used in the United States of America, where it is frequently spoken of as a 'census;' but it lacks the essentials of a census in that its results are not obtained by the aggregation of data collected from individuals, but by the summation of values obtained for different classes of wealth by miscellaneous methods of valuation and estimation. This method aims at giving the value of the wealth itself, irrespective of the question of ownership. It has also been called the 'objective' method, and depends for its success

on the existence of extensive statistical data prepared for other purposes. The earliest Australian estimate on this basis occurs in a paper read before the Australasian Association for the Advancement of Science at Hobart in 1892, in which the government statistician of New South Wales estimated the value of Australian private wealth in 1890 at £1,019,242,000. In his *Seven Colonies of Australasia* for 1892 Coghlan estimated the average wealth of Australia, per head of population, in past years as follows:—1813, £75; 1838, £182; 1863, £130; 1890, £328. Further estimates of this nature were published by the same authority in his *Seven Colonies of Australasia* (1899), and *A Statistical Account of Australia and New Zealand* (1901, 1903).

By far the most complete estimate of this nature prepared for Australia was that of 1915, made by the Commonwealth statistician in connection with the war census. A full account of the estimate is given in Knibbs's *Private Wealth of Australia* (pp. 136-154), and a comparison of the results with Coghlan's inventory estimates for 1890 and 1903 on pp. 156-8. The total private wealth disclosed by this estimate, as at 30 June 1915, was £1,619,517,000—£327 per head of population.

In 1921 another inventory estimate was made for the several States and Territories. The aggregate and the average private wealth were as follows:—

States and Territories.	Estimated private wealth as at 30 June 1921.	
	Aggregate.	Per head of population.
	£	£
New South Wales.	886,100,000	421
Victoria	627,000,000	408
Queensland	271,400,000	356
South Australia	181,900,000	366
Western Australia.	127,300,000	381
Tasmania	68,000,000	319
Northern Territory	3,500,000	889
Federal Territory	700,000	267
Commonwealth	2,165,900,000	397

The figures represent private possessions existing in the State or Territory specified, irrespective of the owner's residence. Private wealth was divided into 15 classes, each valued by the methods most appropriate to its special circumstances. By far the most important of these classes comprised 'land and improvements thereon,' the total for this class representing more than two-thirds of the Australian aggregate. Next in order was 'live stock,' representing about one-sixteenth of the aggregate. The values of the several classes of property and the percentage of each on the Australian total are given in the following table:—

Class of private property.	Estimated value of Australian private property, 30 June 1921.	
	Amount.	Percentage on total.
	£	
(i) Land and improvements thereon	1,361,269,000	62.9
(ii) Live stock	158,833,000	7.3
(iii) Agricultural, dairying, and pastoral implements and machinery	35,964,000	(a)
(iv) Manufacturing plant and machinery	67,718,000	3.5
(v) Mining properties (including plant and machinery)	34,000,000	1.6
(vi) Coin and bullion	61,216,000	2.8
(vii) Private railways and tramways	15,973,000	(a)
(viii) Shipping	7,243,000	0.3
(ix) Agricultural and pastoral products	70,515,000	12.0
(x) Locally manufactured products	104,835,000	
(xi) Mining products (other than gold)	2,660,000	
(xii) Imported merchandise	81,891,000	
(xiii) Clothing and personal adornments	27,289,000	7.6
(xiv) Furniture and fittings, books, pictures, etc.	108,780,000	
(xv) Motor vehicles	27,675,000	(a)
Total	2,165,861,000	100.0

(a) included under (iv).

The *war census* of 1915 included among its enquiries a schedule concerning the net assets held by each person, as owner, agent, or trustee. Owing to the practical difficulty involved in valuing the respective shares of life-tenants and reversioners in property held on trust, and also in readily obtaining reliable values for individual life policies or for benefits accruing in friendly societies and trade-unions, these and similar items were excluded from the individual returns and aggregated under the head of 'trust funds;' the most important items of this aggregate were 'Total value of trust-estates' and 'Australian funds of life assurance companies, friendly societies and trade unions.' In the case of Australian partnerships and companies the individual returns gave the value of the Australian holdings of shares in such concerns; for non-resident partnerships and foreign companies the net assets held in Australia were included as special items. A special return of net assets was obtained from Australian companies. From this was deducted the total value of shares and debentures in companies shown by individual and other returns, and the remainder was taken as representing approximately the interest in Australian companies held by persons not resident in the Commonwealth, together with the margin between the share-valuation of the shareholders and the valuation of net assets made by the companies' officials. The results were as follows:—

Particulars.	Net assets recorded as at 30 June 1915.
	£
Individuals:—	
Resident—	
Males	918,090,197
Females	298,141,465
Non-resident—	
Males	3,895,236
Females	4,099,096
Non-resident partnerships	1,283,004
Trust funds	248,137,367
Companies	144,635,865
Institutions	25,181,146
Total	1,643,463,376

In this case the question of ownership was regarded as of primary importance. Consequently the situation of the property was ignored, results being tabulated according to the residence of the owner. On this account the estimate for the several States and Territories differs materially from the inventory estimate already given. The census totals obtained were as follows:—

States and Territories.	War census aggregate of net assets recorded as at 30 June 1915.
	£
New South Wales	645,699,068
Victoria	565,337,460
Queensland	163,803,435
South Australia	154,623,129
Western Australia	67,869,080
Tasmania	44,945,491
Northern Territory	842,734
Federal Territory	342,979
Total	1,643,463,376

The total number of individual returns received from persons resident in Australia was 2,191,945, representing 1,380,208 males and 811,737 females. The total of the net assets recorded on these returns was £1,216,231,662, of which £918,090,197 related to males and £298,141,465 to females. A classification according to net assets follows:—

Net Assets at 30 June 1915.	Number of returns	Aggregate amount.
		£
Debits and nil	359,729	
Under £100	925,461	28,094,649
£100 and under £250	314,514	50,308,606
£250 „ £500	212,461	75,179,699
£500 „ £750	101,996	61,978,305
£750 „ £1000	59,651	51,495,512
£1000 „ £2500	129,115	200,610,608
£2500 „ £5000	50,478	174,671,344
£5000 „ £10,000	23,359	160,571,087
£10,000 „ £15,000	6,675	80,611,818
£15,000 „ £20,000	2,896	49,943,946
£20,000 „ £25,000	1,562	34,996,516
£25,000 „ £50,000	2,585	88,142,251
£50,000 „ £75,000	722	43,882,001
£75,000 „ £100,000	275	23,620,604
£100,000 and upwards	466	92,124,716
Total	2,191,945	1,216,231,662

These figures somewhat understate the net assets of individual Australian residents, owing to the exclusion therefrom of the figures for trust estates and the funds of life assurance and other provident societies.

The results given above furnish interesting material for comparing the results of the three methods. For the year 1915 the *probate* method gave £1,027,061,000, the *inventory* method £1,619,517,000, and the *census* method £1,643,463,376. Knibbs points out that a comparison of inventory results with those of the other two methods is not satisfactory unless allowance is made in the inventory total for the local holdings of Commonwealth, State, and municipal securities. These are brought to account in the probate and census methods, but are necessarily absent from the inventory total, since they represent not material private wealth in an objective form, but rather a claim on the future production of the community, or, from another point of view, a lien over existing communal wealth. As the amount so held on 30 June 1915 was approximately £140,000,000, the inventory total for purposes of comparison should be increased to, say £1,760,000,000, which appears to be the most reliable estimate of the private wealth of Australia (as ordinarily understood) on 30 June 1915. Knibbs thinks it probable that the war census total, which falls short of this increased inventory estimate by £117,000,000, is an understatement of the position; his reasons are the emergency nature of the war census, the evidence of incompleteness furnished by the returns, and the probability that persons furnishing such returns suspect coming taxation, and hence furnish a conservative estimate. The extent to which foreign capital is included in the above estimate cannot be readily ascertained. Figures obtained from the war census returns go to show that the total is in the neighbourhood of £160,000,000, thus leaving £1,600,000 (£323 per head) as the private wealth of Australian residents on 30 June 1915. The above estimate of foreign capital in Australia of course excludes government borrowings abroad, since such investments are, in the main, represented by a portion of the communal wealth of Australia, which is not dealt with in this article.

C.H.W.

Weather-plant. See ABRUS.

Weaving. See MANUFACTURES.

Webber, WILLIAM THOMAS THORNHILL (1837-1903), born at London on 30 January 1837, and educated at Tonbridge school and Pembroke College, Oxford (B.A., 1859; M.A., 1862; D.D., 1885), was ordained deacon in 1860 (priest, 1861) and appointed curate at Chiswick. In 1864 he was made vicar of St. John the Evangelist, Holborn, and built the church, clergy-house, and schools in Red Lion Square. In June 1885 he was consecrated bishop of Brisbane, and was enthroned in the pro-cathedral there on 17 November. During his episcopate the diocese of Rockhampton was formed and the building of the Brisbane cathedral begun. He collected large sums in England and Australia to endow the diocese and to found a training-school for clergy. He was an ardent advocate of religious instruction in state schools, and planned the 'bush brotherhood' which ministers to the scattered population out back. In 1888 he attended the pan-Anglican synod at Lambeth. He died at Brisbane on 3 August 1903. See CHURCH OF ENGLAND. J.V.C.-B.

Wedge, JOHN HELDER (1792-1872), born in England in 1792 and trained as a surveyor and draughtsman, was in 1826 appointed by the colonial office second assistant surveyor to the government of Tasmania, and reached Hobart during the year. In 1827 he was despatched to the north coast to lay down the courses of several rivers; Evans reported on him as inexperienced, but he was nevertheless ordered in 1828 to make a preliminary survey of a 250,000-acre grant proposed for the Van Diemen's Land Company (q.v.), and on his advice the grant was increased to 350,000 acres. His wiser advice to reserve land for a port and township at Emu Bay was neglected, and the company thus obtained sole control of access by sea to the whole of north-western Tasmania. Wedge was next employed on surveys of the valleys of the Derwent and Huon, but in 1834 joined the syndicate formed by Batman for the exploitation of Port Phillip, and in 1835, on Batman's return from his first exploration, resigned his official position and proceeded to Indented Head to survey the land purchased from the aborigines. From 7 August onwards he surveyed the Bellarine

peninsula and the area north of Geelong, but on 2 September reached the banks of the Yarra and discovered that another party (Fawkner's) was camped there and busy at making a permanent settlement. He formally but courteously warned off the intruders, was told with equal courtesy that they proposed to stay there, and proceeded on his survey by Mount Macedon and Bacchus Marsh back to Geelong. Wedge's plan was forwarded to the governor of Tasmania for confirmation of Batman's purchase from the natives, but Arthur could only pass it on to Bourke (Port Phillip being within the colony of New South Wales), and Bourke disallowed the transaction. The syndicate, however, was partially compensated in later years with a grant of land west of Geelong, and in 1854 Wedge sold his share for £18,000.

Bourke's action left Wedge at a loose end, and he went off to England, returning in 1843 with the first Anglican bishop of Tasmania (F. R. Nixon), who made him manager of the lands belonging to Christ's College at Bishopsbourne near Longford. The rest of his life was uneventful. He settled down on land of his own near Perth in Tasmania to semi-pastoral occupations, represented Morven (1855) and North Esk (1856) in the legislative council, and from February to April 1857 was an honorary member of the Gregson ministry. In later years he moved to the Latrobe district, represented Hobart (1860-6) and the Huon (1866-8) in the council, and died on 22 November 1872.

A controversy in which Wedge is mixed up relates to the naming of the river Yarra. The name (as Yarra Yarra) is of his giving, and it is usually stated that he obtained it from the local tribes, and ascertained that the word meant 'flowing,' and in its duplicated form 'ever-flowing.' Recent research shows that the native name of the river was Birarrang—accented on the second syllable—which Wedge records in his field-book as Berrern; this name he gave to the area between the Yarra and Salt-water rivers, and A. W. Greig suggests that it may survive to-day in an adjacent area as Prahran. Wedge deliberately rejected it as a name for the river, and adopted another native word (he spelt it Yarrow) which the natives frequently used to him in connection, as he thought, with the now destroyed reef of rock below Prince's Bridge. Wedge believed the word to mean 'waterfall,' and the early settlers thought it meant 'flowing,' but there is no evidence of any kind to show what it actually did mean. Among the upper Murray tribes it meant 'gum-tree,' and in Gippsland, on the lower Lachlan, and in some South Australian areas words containing 'yar' mean 'water' or 'creek.' It is an interesting coincidence that Hovell, when in 1824 he saw from Werribee the gap by which the Yarra breaks through the Dandenong Range, at once surmised the existence of an important river there, and previously named it the Yar, after the chief river of his native county Norfolk.

Wedgebill, a perching bird (*Sphenostoma cristatum*) peculiar to Australia, found throughout the drier inland districts; it is usually placed in the family Paridae.

The wedge-bill is dull brown above and dingy white below, with white tips to the tail-feathers. It has a crest of long brown feathers, and a curved, wedge-shaped bill. It frequents the ground, bushes, and low trees, and feeds on insects. The nest is an open, cup-shaped structure of twigs lined with grasses, generally placed in a low bush; the two or three eggs are bluish-green, with dark brown or black markings. Its nest and eggs are thus entirely different from those of other members of the Paridae, and closely resemble those of the coach-whip-bird, to which Gould thought it was related. His view is possibly correct. W.B.A.

Wedgebill (*length 9 in.*).

Weed-fishes. See BLENNIES.

Weeds. See NOXIOUS PLANTS.

Weeping Myall. See ACACIA.

Weevils. See BEETLES.

Weigall, ALBERT BYTHESEA (1840-1912), born at Nantes in Normandy on 16 February 1840 and educated at the Macclesfield grammar school and at Brasenose College, Oxford (B.A., 1862), in 1863 arrived in Melbourne to take up the position of classical master at the Scotch College. In December 1866 his fine scholarship and remarkable success as a teacher secured for him the headmastership of the Sydney Grammar School (see SCHOOLS), with which for 45 years his life was inseparably bound up. A man of 'emotional temperament and resourceful intellect,' with a strange combination of strength and weakness in his character, he raised the school to the highest standard of scholarship and of other achievements by his unsparing work and a lofty conception of his office. An autocrat to his staff, his sympathetic treatment of his pupils won for him an unusual popularity, while he obtained recognition throughout Australia as the mentor of secondary education. In 1880 he helped to found the headmasters' association, and later the teachers' association (now the teachers' guild). He died on 20 February 1912. A resolution then passed by the governing board of the school declared that by the untiring energy, conspicuous ability, and unremitting concentration in his great life-work he had materially advanced the standard of higher education in Australia, and won himself a high position among famous headmasters of the Empire. (C.M.G., 1909.)

See MacCallum's *In Memory of Albert Bythesea Weigall* (Sydney. 1913). J.V.C.-B.

Weld, SIR FREDERICK ALOYSIUS (1823-1891), born at Bridport in Dorset on 9 May 1823 and educated at Stonyhurst College and at Freiburg in Switzerland, migrated in 1844 to New Zealand, where he engaged in cattle- and sheep-raising. In 1848 he refused Sir George Grey's offer of a seat in the nominee legislative coun-

cil, and actively advocated representative institutions. In 1853 he was elected to the first house of representatives, in 1854 became a member of the colony's executive council, and was minister of native affairs in the first Stafford ministry from November 1860 to July 1861. In 1864 Grey asked for his help in a crisis due to a Maori war and threatening bankruptcy, and he became premier on 24 November. His policy of dispensing with British troops (which cost the English ratepayer two and a half millions per annum), and conducting the war with regiments of colonists and friendly Maoris, was highly successful, as he had great influence over the Maoris, to whom he gave representation and native land courts. During his premiership the capital was moved to Wellington, and the finances were placed on a proper footing. In October 1865 he resigned office and returned to England with broken health, but four years later was sent to Australia as governor of Western Australia: here he remained until December 1874, established railway and telegraphic communication on a large scale, founded a progressive system of education, and inaugurated many exploring expeditions. From January 1875 until April 1880 he was governor of Tasmania; then he was transferred to the Straits Settlements, retired from the colonial service in 1887, and died in England on 20 July 1891. (C.M.G., 1875; K.C.M.G., 1880; G.C.M.G., 1885.)

J.S.B.

Wentworth, D'Arcy (1762-1827), born at Portadown in northern Ireland in 1762, in 1782 joined a local volunteer regiment as ensign and was promoted lieutenant in 1784; when the regiment was disbanded in 1785, he went to London to study medicine, and there made the acquaintance of the Yorkshire branch of his family, whose head was Lord Fitzwilliam. In December 1787 he was tried at the Old Bailey for highway robbery on Hounslow Heath; but then, and on three later indictments of a similar character, he was acquitted, and on the last occasion (December 1789) it was announced in court that he had secured an appointment as assistant surgeon in the convict fleet just starting for New South Wales. He sailed in the *Neptune* early in 1790, reached Port Jackson on 28 June, and on 1 August was sent to Norfolk Island to act as assistant in the hospital. King, then lieutenant-governor, valued his services highly, and on 10 December 1791 made him a superintendent of convicts in addition to his medical duties. In March 1796 he returned to New South Wales, and Hunter made him assistant surgeon to the settlement, but in May 1798 sent him back to the island to relieve Thomas Jamison. In May 1799 he was brought back to be assistant surgeon at Parramatta; in July 1802 he applied for (and was granted) the position of acting-staff surgeon at Norfolk Island, but in September decided that he would rather stay in Parramatta, where he was lieutenant of the Loyal Association of local volunteers, and farmed 172 acres —an area which by 1806 he had increased to 585. Early in 1804, however, he was made surgeon of Norfolk Island—which involved attendance on men of the New South Wales Corps and therefore gave him military status; he retained this post until the middle of 1806, during which term his humane treatment saved the life of Joseph Holt (q.v.). By November 1806 he was again assistant at Parramatta; Bligh in 1807 suspended him for sending hospital patients to work on his farm, but after Bligh had been deposed Wentworth was court-martialled for this alleged offence at his own request and was acquitted. Foveaux granted him an additional 500 acres for making 'extensive improvements' on the land he already held. Meanwhile he had re-established relations with the Yorkshire branch of the family, and in 1807 Lord Fitzwilliam procured for him from the colonial office a year's leave—which, when he discovered that Macquarie was likely to favour him, he did not use.

With Macquarie's arrival Wentworth's troubles vanished. Within four months the new governor had recommended him for the position of principal surgeon, adding a eulogy of his character which was duly noted by the colonial office; on 1 January 1811 he was also made head of the Sydney police force, with wide magisterial powers; at the same time he became a party to the contract under which the Sydney hospital was erected (see Hospitals), and Macquarie defended this transaction on the ground that Wentworth was not only opulent but 'a Man on Whose Rectitude of Conduct and Zealous Attention to the due and faithful Execution of the Contract I could safely rely.' (Macquarie appears to have believed that Wentworth had come out as a convict—an entirely erroneous assumption.) The rest of his public career was comparatively uneventful. On 5 May 1818 he asked leave to retire on a pension. He left the medical service in October 1819 and the police in March 1820; he continued, however, to act as a magistrate, and in July 1821 was reappointed superintendent of police until 1824. He died at Homebush near Sydney on 6 July 1827.

His eldest son William Charles Wentworth is separately dealt with. His second son, D'Arcy, was educated in England, joined the army—he was the first Australian-born commissioned officer—retired as a major on half-pay in 1843, and settled in Tasmania, where he died in 1861. A third son, John, also educated in England, joined the navy, and in 1820 was drowned at sea off the coast of Africa.

W.J.

Wentworth, William Charles (1793?-1872), born at Norfolk Island and sent to England in 1800 to be educated at Greenwich near London, in 1811 returned to New South Wales, was appointed by Macquarie acting provost-marshal, and on 28 October entered into a bond to pay for six cows, with which stock he started in August 1812 a farm at Vermont on the Nepean. The date of his birth cannot be certainly ascertained; the date 1793 is that generally accepted, but in that case he was acting provost-marshal at 18 and signing bonds while still an infant in law. Some authorities make the date 1791, and 1790 is possible.

Wentworth's first public appearance was made as one of the three explorers who in 1813 achieved the crossing of the Blue Mountains (see Exploration by Land). [For this each of them was promised a grant of 1000 acres in the country west of the mountains when it should be opened up, but only Lawson took his grant there, both Blaxland and Wentworth preferring land east of the mountains.] Still in search of adventure, and threatened with lung-disease, Wentworth in 1814 joined the schooner *Cumberland* on an island cruise for sandalwood; while superintending work at Rarotonga in the

Cook group he narrowly escaped death at the hands of hostile natives, and it was only his knowledge of mathematics that brought the schooner safely to port after the master's death on the way.

Following on such adventures, the monotony of life at Vermont proved intolerable, and in 1816 young Wentworth urged his father to let him study law in London. D'Arcy Wentworth favoured the army, seeing no prospects for a barrister in the colony, and despatched his son to seek the influence of Earl Fitzwilliam in securing a commission. William signalized his departure by indulging in an anonymous lampoon (see 'PIPES') directed against Colonel Molle, an official long hated by emancipists. As their leader (though, strictly speaking, he was not one of them), D'Arcy Wentworth might have paid dearly for the suspicion he immediately incurred, had not the intervention of Macquarie and the subsequent disclosure of his son's authorship cleared his name. Arriving in England, William Wentworth induced Earl Fitzwilliam to let him study law, and in 1817 his name was entered at the Inner Temple; but the old bronchial affection soon drove him abroad, and for a time he wandered unhappily through a Europe devastated by the Napoleonic wars. By the autumn he was able to return to work, and on 4 February 1822 was admitted to the bar.

Meanwhile his interest in New South Wales had not waned. An attack on his father made in the house of commons in 1819 by H. G. Bennet—who asserted that D'Arcy Wentworth had been sent out as a convict—provoked an indignant outburst which was only allayed by a public apology. More notable was young Wentworth's publication, in May 1819, of the first authoritative account of colonial life, *A Statistical, Historical, and Political Description of New South Wa'es.* In it he advocated the introduction of free political institutions, the removal of economic barriers between the colonies and Great Britain, and the promotion of immigration on a large scale to develop the colony's pastoral and agricultural resources. The book ran through three editions within five years, the tide of emigration to Australia which set in thereafter being attributed to its influence by no less an authority than E. G. Wakefield (q.v.).

Anticipating the long struggle for political freedom, Wentworth set himself to the study of English constitutional law. The recommendations of Commissioner Bigge had added weight to his arguments for political reform, and the act of 1823 (see CONSTITUTIONS) achieved the first breach in the system of gubernatorial autocracy. A legal career in Sydney was now open to him. Before returning he competed for the chancellor's medal offered at the Cambridge 'commencement' of 1823 for a poem on the subject of 'Australasia.' Without exhibiting imaginative gifts of the highest order Wentworth's poem was so redeemed by patriotic fervour as to place him second among the competitors, the prize being awarded to the graceful verse of Winthrop Mackworth Praed.

In July 1824 Wentworth returned to Sydney with an English friend, Robert Wardell (q.v.), to practise in the newly established supreme court. Emancipist grievances soon provided him with a thriving practice, one of his first cases being an unsuccessful application on their behalf for inclusion in the jury lists. By 1827 he was able to purchase the Vaucluse estate on the southern shore of Port Jackson, and in 1829 completed the building of a house which still stands in Vaucluse gardens as a public monument to him.

On 14 October 1824 Wentworth and Wardell startled the colony by publishing the *Australian*, an uncensored rival to the official *Sydney Gazette*. The ardent nationalism and democratic tone of the new paper won immediate support, to the chagrin of the official class, which was further dismayed when Governor Brisbane established the freedom of the press by releasing the *Gazette* itself from government control. Through the *Australian* Wentworth now began to agitate for further instalments of constitutional government. At the public welcome to Darling he bluntly warned the public to beware of the autocratic bias of military governors; in November 1826, apropos of the Sudds-Thompson case (see DARLING, SIR RALPH), the *Australian* demanded Darling's recall and the extension of full citizen rights to all free men; and after a three years' press campaign Wentworth despatched to the colonial office an elaborate impeachment of the governor, from which a select committee of the house of commons eventually exonerated him. Darling meanwhile, acting on direct orders from England, but instigated also by the fear that his authority was being undermined, introduced in the legislative council bills to restrict newspaper independence by means of licences and stamp duties, and encouraged a series of actions for libel against the editors of the *Australian* and its lately-born imitator the *Monitor*.

Having transferred his share of the *Australian* to Wardell, Wentworth was free to act as chief counsel to the offending editors. At the trials which followed (1827 to 1829) he added lustre to his already sound reputation as an advocate, while continuing to advance unimpeachable arguments in favour of judicial reform. A libel case against Hayes, the editor of the *Australian* in 1829, roused Wentworth to protest so vigorously against the injustice of trial by military jury that Judge Stephen advocated the granting of a fresh trial. He was overruled by the other judges, Forbes and Dowling, but lack of judicial unanimity on so important a question could not be ignored by the British government. In August 1830 Darling was ordered to extend trial by jury, in the accepted meaning of the term, to the criminal courts of New South Wales. Successful actions for damages, instituted in March 1830 by Wentworth, against certain government officials on behalf of Hayes and the editor of the *Monitor*, were followed by a signal victory won on his own behalf against the editor of the *Gazette*, who had reprinted some libellous reflections on his character uttered by the exasperated governor in the course of a public address. Darling's recall completed the triumph of the liberal party, and in October 1831 Wentworth celebrated the downfall of military autocracy by entertaining the citizens of Sydney with a gigantic fête at Vaucluse.

On 26 January 1827 Wentworth had already opened the campaign for representative government, declaring that the existing system, designed wholly for a convict settlement, was extravagant and oppressive. A petition praying for a popular assembly of 100 members elected by manhood suffrage, was adopted and despatched to the house of commons; Huskisson dismissed it as an 'emancipist' effusion, but in

1828 enlarged the legislative council by way of a harmless concession. On 26 January 1833 the free settlers under Sir John Jamison joined Wentworth and his 'emancipists' in a second petition for representative government. This attracted the attention of E. G. Wakefield's followers, and Joseph Hume urged Wentworth to state the case for New South Wales before the house of commons. Preferring the advice of Henry Lytton Bulwer, Wentworth remained in Sydney to keep the Wakefield party posted in colonial affairs. In May 1837 (again in conjunction with Jamison) he formed the Australian Patriotic Association to agitate for an amendment of the constitution, and drafted two bills, one providing for a nominated council and an elective assembly on the Canadian model, the other for a single house of 50 members (one-fifth to be nominated by the Crown, four-fifths elected by the people). Charles Buller, the association's agent, was instructed to favour the second bill in his negotiations with the colonial office. With the support of two governors (Bourke and Gipps) and of Chief Justice Forbes, as well as the backing of the Wakefield group—which in 1840 had secured the abolition of transportation as a preliminary step—Wentworth's second bill, with an increase in the proportion of crown nominees and the insertion of a property qualification for electors, was adopted as the basis of the constitution act of 1842.

The rapid development of pastoral life in the 1830s, and the shortage of labour caused by the abolition of transportation in 1840, led to a general shifting of class distinctions from a social to an economic basis. Discerning in the pastoral industry the root of a new and vigorous national life, Wentworth had long since taken up land as a squatter outside the boundaries of settlement, and in 1836 abandoned his 'emancipist' connection at the bar to devote himself more fully to his new interest. At the elections to the new legislature in June 1843 he stood for Sydney as a squatters' candidate, and under the £20 franchise (which precluded an effective democratic opposition) was returned at the head of the poll. When the council assembled in August, the ministry instituted by Sir George Gipps was confronted by a formidable opposition in the landed interest. The leadership of the popular party fell to Wentworth, whose constructive imagination, logic, and eloquence had already won him a reputation as an orator and publicist. His first task was to restore colonial credit, which had collapsed under the strain of fluctuating seasons and over-speculation in land. He failed to carry a bill to prohibit excessive rates of interest on borrowed money; but the solvent debtors act (to restrain forced sales until a fair price could be obtained for property) and the lien on wool act (to enable owners to raise money on stock without delivery to mortgagees) immediately relieved the situation. Though not strictly reconcilable with English law—and therefore disallowed later by the colonial office—the lien on wool act proved so valuable that it was continued by temporary enactments, and finally secured a permanent place in the statute book.

Retrenchment in public expenditure was the next aim of the opposition. The estimates for 1844 at once brought Wentworth into collision with Gipps and his ministers over the disposal of the £81,500 reserved annually to the crown for the expenses of government. At Wentworth's instigation the council asserted its right to revise the lavish appointments made under the reserved schedules, and reduced the supplementary vote for judicial expenses. The following year, when Gipps refused to revise the appointments under dispute, Wentworth persuaded the council to reject the supplementary estimate altogether, and even threatened to stop supplies as far as he was able until full control of colonial revenue was conceded by the crown. At the same time he urged the council to claim the land revenue (which had been reserved to the crown in 1833), asserting that under Bourke's 'compact' of 1835 control of the land-fund had been conceded to the council in return for an undertaking to defray the cost of police and gaols. A large proportion of the police estimate was struck out of the 1844 budget, as a protest against Gipps's refusal to surrender the disputed revenue.

The passing of an act in 1840 extending to New Zealand the laws of New South Wales had aggravated the antagonism between Gipps and Wentworth. Despite a warning from the government that land transactions with natives would no longer be considered valid, Wentworth had recently purchased from seven chiefs 20,000,000 acres in the South Island of New Zealand for £200 in cash and a promise of 'a like sum per annum as long as they should live.' Gipps dismissed his claim in terms of unsparing contempt; Wentworth resigned from the magistracy and 'swore eternal vengeance' on the government. In 1844 an opportunity was given him. As one of the largest cattle-holders in the colony, with extensive stations on the Bathurst and Liverpool plains, Wentworth found himself obliged to take out 15 depasturing licences where two had previously sufficed, and, in common with other squatters, had to face the probability of losing his stations altogether. A Pastoral Association was immediately formed to defend the landed interest, and Wentworth undertook to raise the constitutional issue in the council. In June 1844 he declared that in taxing the squatter for the use of common pastures Gipps had infringed an inalienable right of British subjects, and a select committee which investigated the squatters' grievances reiterated in its report Wentworth's arguments for fixity of tenure and the handing over of land revenues to the control of the council.

Meanwhile on 21 June he began the series of speeches, at once cogent and impassioned, which were finally to secure self-government for New South Wales. Attacking the reservation of the land-fund and the civil list, the burden of convict establishments, and the attempt to force an unsuitable form of local government (district councils) on the colony, he claimed that the representatives of the people had not enough control over the executive—nothing less than the granting of responsible government should satisfy them. The example of Canada had shown that self-government in local affairs could safely be conceded without endangering Imperial interests. Standing gallantly by his orders from the colonial office, Gipps resisted these claims at every turn, provoking Wentworth to retaliate in violent and often unjust terms. When in August 1845 the British government refused to entertain the new demands, relations between the two protagonists were strained almost to breaking-point; nor was the tension relieved until in January 1846 fixity of tenure was promised to the squatters and

FitzRoy was despatched to release Gipps from his weary vigil.

The amiable FitzRoy made no attempt to pursue an independent policy, and henceforth Wentworth was master of the situation. Contemporary portraits represent him as a typical squatter, in rough Australian homespun, lolling upon the council benches in an attitude strangely in contrast with his personality. His voice was extraordinarily powerful, his utterances often elevated and impassioned. Their brilliance, however, was not always sustained; his language was at times commonplace, and his delivery awkward. But sheer force of personality rendered his speeches impressive, and in moments of strong feeling the unbroken sublimity of his language swept the colonists, whatever their sober convictions, into enthusiastic accord with the man who had placed himself at their head.

But his supremacy was not unchallenged. As early as September 1842 he had roused the suspicions of the free labourers by forming an association to import coolies from the East Indies in order to relieve the labour shortage which followed the abolition of transportation in 1840. The project was temporarily abandoned owing to opposition both in the colony and in England; but Wentworth continued to experiment with Chinese labour on his stations, and in December 1852 again tried to obtain permission to import coolies from India. The working-classes bitterly resented these attempts to force them into competition with Asiatics; but it was not until the waste lands act of 1847 (granting the squatter a 14 years' lease) drove Robert Lowe (see SHERBROOKE, LORD) in disgust from the squatting party that the discontent of the unenfranchised classes found expression. Wentworth's attempt to revive transportation in the interests of the squatters lent weight to the invective of Lowe, his one serious rival in Australian politics. When W. E. Gladstone proposed in April 1846 to send a limited number of convicts to New South Wales, Wentworth obtained a committee to consider the project, which on the last day of the session reported in its favour. Though it had not received the sanction of the council, the report was inadvertently despatched to the colonial office; but in the following session public opinion forced the council to quash it. In April 1848 Wentworth's party agreed to a scheme by which equal numbers of free emigrants and ticket-of-leave men should be despatched to New South Wales, and in June 1849 the *Hashemy* arrived (see TRANSPORTATION) with its due complement of convicts, but no immigrants. Roused by the speeches of Lowe and Parkes, the radicals despatched protest after protest to the colonial office, and within the council itself a series of anti-transportation resolutions was carried in spite of Wentworth's energetic protests. The controversy was happily terminated by the gold discoveries of 1851.

Meanwhile the impending separation of Port Phillip, and the consequent necessity of modifying the constitution of New South Wales, had moved Earl Grey in 1847 to devise a bicameral legislature, with an assembly elected by district councils. Wentworth immediately organized opposition to this scheme, asserting that the colonists would welcome organic changes in their legislature far less than the evidence of a more liberal spirit in Downing-street. The outcome was the act of 1850, separating Victoria from New South Wales, reconstituting the New South Wales council on much the same footing as before, and (the really vital provision) allowing the colonists to amend their own constitution.

At the moment Wentworth was engrossed in a scheme for promoting higher education. Largely through his efforts a board for the administration of primary, non-denominational schools had been established in 1846. In September 1849 he asked the council to take over the land and buildings of the defunct Sydney College (see SCHOOLS and UNIVERSITIES) for a university. He obtained leave to bring in a bill, but denominational jealousy and criticism from Lowe delayed its passage until September 1850, and the university of Sydney was not inaugurated until October 1852.

The constitution act of 1850 pleased the colony little more than Earl Grey's double-election scheme. Misled by the retention of the old grievances—the independence of the executive and the reservation of the land revenues and civil list—Wentworth in May 1851 drew up a declaration and remonstrance. This was followed by an elaborate petition for responsible government, and a guarantee that, if the council obtained full control of the revenue, it would furnish an adequate civil list. Indignant at the reply from Earl Grey, who could find no satisfactory basis on which to separate domestic from Imperial concerns, Wentworth proposed on 22 July 1852 that the customs act should remain in force for two years only, in order to stop supplies if self-government was not conceded within that time. His suggestion was not adopted, but on 6 August he persuaded the council to declare that no future estimates would be considered until the grievances enumerated in the petition of 1851 were redressed. In accordance with the provision in the act of 1850, he had already moved on 16 June 1852 for a committee to prepare a constitution giving the colonists the right to control their own revenue, appoint their own officers of government, and enjoy plenary powers of legislation in all matters not affecting Imperial interests. A committee of 12, with Wentworth as chairman, reported on 9 September. The chief difficulty had been to secure a council which would act as a check upon the democratic element in the assembly, while discharging 'the revising, deliberative and conservative functions' which devolved upon an upper house. The committee's bill provided for a council of 21 nominees appointed by the governor (two-thirds drawn from members of past legislatures) and an assembly of 72 members elected on a £10 franchise. To guard against hasty legislation, Wentworth advised the council to postpone consideration of this measure until the following year; and, when the council reassembled in 1852, FitzRoy announced that the new secretary for the colonies, Sir J. Pakington, was anxious to concede the principle of self-government, and advised the drafting of a constitution without delay. On 20 May Wentworth was again appointed chairman or a select committee to devise a constitution. Deeming himself bound by the terms of Pakington's despatch to propose a legislature on the Canadian model, he reported on 28 July in favour of an assembly of 50 elected on a £10 franchise, and a council of not less than 20 crown nominees. He suggested also the conferring of hereditary titles on colonists of public merit, such titles to carry with them the right to a seat for life in the upper house (see PEERAGE, AUSTRALIAN). Only bills specifically

WESTERN AUSTRALIA

Inset A: South-Western Corner. Inset B: Perth and Environs.

affecting Imperial interests were to be reserved for royal assent. Changes in the constitution would require a majority of two-thirds in the assembly.

Alarmed at Wentworth's assertion that he had 'no wish to sow the seeds of a future democracy,' the radicals began to agitate for an elective upper house, and the redistribution of the assembly seats on a population basis. Wentworth's part in framing an act of 1851, which reconstituted the electoral districts of New South Wales in the interests of the squatters, had made him unpopular with the townsfolk, and under the new £10 franchise he was returned only third on the poll for Sydney in the following September; but he still insisted that property as well as population should be considered in distributing the voting power. His historic imagination had fallen captive to the creed of the landed aristocracy which had ruled England in the 18th century. Like his Whig ancestors, he had formed a conception of government resting on an alliance between the principle of property and the spirit of popular rights. It was the duty of the landed interest, which had built up the economic life of the colony and sought and won for it political freedom, now to safeguard that freedom against the irresponsible element in the towns. So powerful was his speech when moving the second reading of the bill on 16 August that the radicals in the council secured an adjournment for a week to recover from its force. On 2 September Wentworth nevertheless carried the reading by an overwhelming majority. In committee he announced that the hereditary titles clauses had been abandoned in deference to public opinion. Otherwise no material alterations were made, and the bill was read a third time without difficulty on 22 December. Wentworth then departed for England to shepherd his measure through its final stages. As a memorial of his services to the colony a statue was commissioned for the hall of the university, and a fund established to found a scholarship in his name. The bill to confer a constitution on New South Wales came before the house of commons on 17 May 1855, was attacked by Lowe in the interests of the colonial radicals, but passed unscathed—save for the restoration of the royal veto, and the deletion of the clause requiring a two-thirds majority for constitutional changes. On 16 July the bill became law, and was despatched to New South Wales with a guarantee that the colonial office would henceforth abstain from interfering in the colony's purely domestic concerns.

While a younger and increasingly democratic generation of Australians tried its hand at self-government, Wentworth remained in England, only returning to the colony in 1861. He was called upon at once to assist the government in a constitutional crisis which had arisen over the Robertson land bills. Council and assembly being at a deadlock, Charles Cowper (q.v.) had sought to flood the upper house with amenable nominees, only to be greeted by the resignation of all the original members. Though opposed to a measure which threatened the economic supremacy of the squatters, Wentworth agreed to accept the presidency of a new council. Cowper had already pledged himself to make the council elective, and the recent swamping measure had shown Wentworth how dangerously elastic the nominee system might become. The project was abandoned, however, when the assembly refused to countenance Wentworth's provision for a high property qualification. Alarmed at the radical spirit which had permeated Australian politics, Wentworth retired from the council in October 1862. In the same month, having stamped the impress of his powerful personality, for good or evil, on every political and social institution in the colony, he quitted its shores for ever. For ten years he enjoyed the leisure of English country life, dying at Wimborne in Dorset on 20 March 1872. The government of New South Wales accorded him a state funeral, and on 6 May 1872 he was buried in the family vault at Vaucluse.

N.O.

Wesleyans. See METHODIST CHURCH.

West, JOHN (1808-1873), born in England in 1808 and in 1829 ordained to the ministry of the Congregational Church, came to Tasmania in 1839 under the auspices of the London Missionary Society and settled in Launceston. A few years later he threw himself vigorously into the agitation against transportation and was sent to secure support in Sydney and Melbourne, a mission which he carried out successfully. A letter published in Henry Parkes's paper, the *Empire,* which asserted that he had left his flock unfed, was the occasion of a libel suit which West won with £100 damages. One who often heard him preach describes his curious habit of tying knots in his handkerchief as he developed his argument. He continued his ministry in Launceston until 1854, when he removed to Sydney to become editor of *The Sydney Morning Herald,* a position he held till his death. His *History of Tasmania* (Launceston, 1852) is a picturesque and, on the whole, fairly accurate work. He died in Sydney on 12 December 1873.

T.D.

Western Australia (area 975,920 square miles, nearly a third of the whole continent) comprises all Australia west of 129° E. long. Its geography and geology are dealt with in the articles under those names.

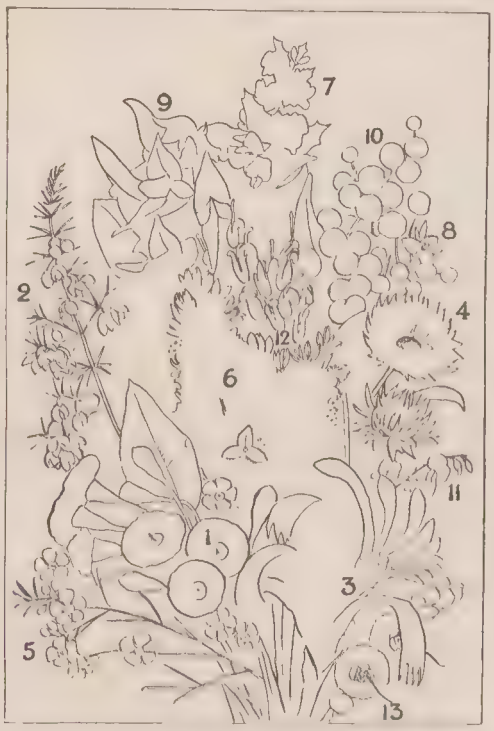
History.—By the beginning of the 16th century Portuguese enterprise had opened up a sea-route to Asia round the Cape of Good Hope, which from that time was usually followed by vessels engaged in the lucrative trade with the East Indies. Voyaging in the uncharted waters of the Indian Ocean, they might easily stray across it to the western shores of Australia, and the outlying portions, such as the Abrolhos, may have been known very early in the 16th century; it is asserted that the Portuguese navigator Meneses touched there in 1527, and some existing charts of the period give colour to that statement. There was, however, no definite knowledge of any portion of the Australian coast-line until the Dutch entered the field of East Indian trade. Their ships, in order to avoid the bad weather so frequent in the central areas of the Indian Ocean, and to take advantage of the prevailing winds, sailed eastward as far as possible before turning northward to Java or other islands, and to this is due the frequency of Dutch names on the western coast. For the Dutch discoveries see AUSTRALIA, DISCOVERY OF.

From Tasman's time onwards the interest of the Dutch in Australian exploration flagged, mainly because it was discouraged by the authorities in Holland. The sterile nature of the country promised little profit from either trade or agriculture there, and the whole region (though still nominally included in the lands

of the Dutch East India Company) was left in the undisturbed possession of the aborigines. Towards the end of the 17th century interest revived a little, and in 1696 Willem de Vlamingh was despatched in the *Geelvinck* to examine the western coast of New Holland in the hope of securing information about a missing vessel. His voyage is described under AUSTRALIA, DISCOVERY OF, as are those of William Dampier a century earlier. Dampier's unfavourable reports of the land and its inhabitants did not encourage the British government to follow up his investigations, and the British flag was not again seen in Australian waters until 1770. The description then given by Cook and Banks of the eastern coast naturally diverted attention for a time from the west, but the Frenchman St. Alouarn in 1772 (see EXPLORATION, FRENCH) and the Englishman George Vancouver in 1791 (see EXPLORATION BY SEA) visited parts of the western coast, as did D'Entrecasteaux in 1792, Flinders in 1801-2, and Baudin in 1801 and 1803.

There is no further record of any voyage to Western Australia until 1817, when Freycinet in the *Uranie* anchored in Shark Bay and then proceeded along the north-western coast to the Pacific. In 1825 de Bougainville cruised along the southern coast. This continued French activity in Australian waters, particularly on the western side, aroused in England a strong suspicion that France was looking for a suitable place for settlement. It was, moreover, at that time doubtful whether Britain could rightly claim the whole continent. The colonial office therefore suggested to Darling the advisability of establishing small settlements along the western coast; after some discussion King George's Sound was selected as one of three sites, and early in November 1826 the brig *Amity*, with a detachment of troops and convicts under the command of Major Edmund Lockyer (q.v.), left Sydney to form a penal establishment there. The party arrived on Christmas Day, and next day established at the foot of Mount Clarence a settlement to which Lockyer gave the name of Frederick's Town, in honour of the Duke of York. At the end of four months Lockyer handed over the command to Captain Joseph Wakefield and returned to Sydney. In 1831 the convicts were withdrawn, and the establishment was brought within the boundaries of the newly founded colony of Western Australia.

The arrival of another French ship in Port Jackson shortly after Lockyer left strengthened Darling's belief that a more definite occupation of the western side of the continent was necessary. Captain James Stirling (q.v.), who was awaiting at Sydney a favourable opportunity to move the Melville Island settlement to Raffles Bay (see NORTHERN TERRITORY), suggested to the governor that the intervening time might be spent profitably in a further examination of Swan River, which had been made the subject of an exhaustive survey by the French in 1801. Darling was impressed by the report which Stirling brought back, and sent him to England to lay the position before the colonial office. At first the British authorities were disinclined to incur the expense of establishing a new colony, and probably no action would have been taken had not a syndicate approached the government with proposals for colonization. This syndicate (Sir Francis Vincent, Colonel T. Potter Macqueen, E. W. H. Schenley, and Thomas Peel) offered to settle at Swan River 10,000 persons; to find them in provisions and other necessaries; to send out 1000 head of horned stock; and to arrange for communication between Sydney and Swan River. The whole undertaking was to be completed within four years. In return for the expenditure incurred (which they estimated at £300,000) they asked for land at a valuation of 1s. 6d. per acre—four million acres in all. The colonial office declined to give them four million acres, but offered one million; this was not satisfactory to the syndicate, which disbanded, but Thomas Peel undertook to carry out the scheme in accordance with the government's offer. Regulations offering land to



KEY TO PLATE L.

FLOWERS OF WESTERN AUSTRALIA.

1. Scarlet-flowering Gum (*Eucalyptus ficifolia*).
2. Sweet-scented Boronia (*Boronia megastigma*).
3. Kangaroo Paw (*Anigozanthos Manglesi*).
4. Everlasting Daisies (*Helipterum roseum*).
5. Geraldton Wax-plant (*Chamaelaucium uncinatum*).
6. Western Australian Christmas Bush (*Nuytsia floribunda*).
7. Chorizema-leaved Hovea (*Hovea chorizemifolia*).
8. Slender Thysanotus (*Thysanotus tenuis*).
9. Green Bird Flower (*Crotalaria Cunninghami*).
10. South Australian Golden Wattle (*Acacia pycnantha*).
11. Mangles's Chorizema (*Chorizema cordatum*).
12. Native Fuchsia (*Grevillea Wilsoni*).
13. *Verticordia grandis.*

Drawn by Edith A. King.

Bacon & Co. Engrs.

FLOWERS OF WESTERN AUSTRALIA

(A Key to this Plate is published on opposite page)

settlers on the syndicate's terms were issued early in December 1828, and modified in January 1829; steps were taken to appoint the necessary officials (the chief command being given to Stirling), and to arrange for their transport to Swan River. In the meantime, to set at rest the question of national ownership, Captain Fremantle was despatched in H.M.S. *Challenger*, reached Cockburn Sound on 27 April 1829, and on 2 May took formal possession in the name of the Crown, remaining to guard the flag until the first band of colonists should arrive. These, with the officials, left England on 6 February 1829 and reached their destination on 1 June, but were compelled by rough weather to land on Garden Island. On the 18th Stirling landed on the mainland at Rous Head and proclaimed the colony under the name of Western Australia. While the expedition was in transit an act providing for its future government was passed in the British parliament on 14 May.

Stirling's first tasks were to select sites for a port and a capital, and to allot land to settlers. The site of the port was settled by nature, for it had to be at the mouth of the river; it was named Fremantle in honour of the captain of the *Challenger*. The location of the capital was a matter of greater difficulty; the neighbourhood of Rocky Bay was at first suggested. The main reason for the final choice, apart from the natural beauty of the position, was the existence of low-lying flats along the river to the eastward; these, it was believed, could be cleared and tilled without much effort, and the settlers might thus do something towards supporting themselves. The name of Perth was bestowed upon the town as a tribute to Sir George Murray, then secretary for the colonies, who represented that city in the house of commons. The new Perth was founded on 12 August by the simple ceremony of cutting down a eucalypt which stood on the block now occupied by the public offices. The laying-out of the town was undertaken by the surveyor-general, and during August the officials took up their quarters there. During the rest of the year settlers were being established on their land, and by the end of it the colony was fairly launched (see PERTH).

Stirling administered the colony from 1829 to 1839—at first without assistance, after 1832 with the help of executive and legislative councils consisting of the principal officials. This period can scarcely be regarded as one of expansion. Immigration set in rapidly in 1829, but soon began to dwindle, and after a few years practically ceased; settlers found that the land did not come up to the glowing descriptions of it circulated in England, and some were quite unfitted for pioneer work in a new country. Ignorance of local conditions, aggression by the natives, a dearth of labour through the cessation of immigration, and isolation from the rest of the civilized world, also damaged the colony, and the population only increased from 1800 in 1830 to 2150 in 1839.

Progress, however, was made. Exploratory tours were undertaken; little by little, land was made available both for settlers entitled to grants and for selection by purchase after the grant-system ended. Perth and Fremantle became permanent townships, and smaller settlements sprang up at Guildford, York, Augusta, Albany, and the Vasse. Abortive attempts at journalism, in manuscript and print, were made in 1831-2, and in 1833 a weekly newspaper, the *Perth Gazette*, commenced publication. As the colony progressed, the issues became more frequent, and the newspaper developed into the still existing *West Australian*. In 1840 another weekly paper, the *Inquirer*, commenced publication. In 1837 the Bank of Western Australia was established; in 1841 it sold out to the Bank of Australasia, which desired to establish a branch in Perth. Dissatisfied shareholders then established a new institution, the Western Australian Bank (still in existence). During Stirling's term extensive marine and land explorations were carried out, the one by H.M.S. *Beagle* and the other by George Grey (see EXPLORATION BY SEA, EXPLORATION BY LAND, and GREY, SIR GEORGE).

Stirling was succeeded as governor by John Hutt (1839-46), who was not popular, partly because he adhered strictly to regulations, partly because he was favourably disposed towards the colonial office, the very name of which was anathema to the colonists of the time, and partly because his attitude towards the aborigines ran counter to public opinion. He did much, however, to lift the colony from its depression. Recognizing the value of an export trade, he urged the colonists to exploit their natural resources, and some exports of horses and cattle, sandalwood, and potatoes were made to the Mauritius, India, and Singapore; whaling companies were also formed, and a considerable quantity of oil and bone was sent to England; and the trade in Western Australian timbers, which has since figured so largely in the State's commerce, was initiated. Wool had been exported since 1834; when Hutt became governor, its export value was £2278, when he left it was over £13,000. Other matters of moment during his term were the addition of unofficial members to the legislative council, Eyre's journey across the continent from Adelaide to King George's Sound (see EYRE, EDWARD JOHN), and the abortive attempt to establish a settlement at Australind (q.v.). Apart from the Australind venture there was practically no immigration at all, and the labour difficulty became more and more accentuated—so much so, that the close of Hutt's administration coincided with the beginning of the agitation for convict labour.

Much criticism has been levelled at the colonists of that time for seeking to introduce penal labour just when other colonists were making a determined effort to free themselves from the system. It must be remembered, however, that after nearly 20 years' existence the population of the colony was less than 4500, its total area under crop 4836 acres, its revenue £15,000, and its exports worth only £20,000, two-thirds of which was represented by wool. There was no money available for the construction of roads or other public utilities; even if there had been, labour was lacking. The colonists, too, saw the material advantages which other colonies had reaped from the presence of convicts, and felt that their own hope of progress depended on the introduction of the same element. They did not proceed hastily in the matter, but spent three years in preliminary consideration; then boys from Parkhurst reformatory were tried as an experiment, and liberated prisoners from Pentonville were also suggested. Neither of these schemes, however, could bring to Western Australia the quantity of labour required. Two factors which developed while the matter was under consideration had a distinct bearing on the ultimate issue. The British government evolved a system of transportation which, it was believed, would be free from the horrors previously practised in the eastern colonies, and agreed that for every convict sent to a penal settlement a free im-

migrant should also be sent. The order-in-council constituting Western Australia a penal settlement was passed in May 1849, and the first ship with convicts arrived on 1 June 1850, while the colony was celebrating its 21st birthday. The system continued until 1868, during which time 9720 male convicts were sent to Western Australia (no female convicts were sent). Much may be said upon the ethical side of the question, but the material benefit was indubitable. The population increased to 22,733, the revenue to £99,496, the acreage under crop to 50,000, the number of sheep from 128,000 to 600,000, and the exports to £192,000; permanent main roads were built through the settled districts; labour was made available through the conditional-pardon system, and public buildings that were urgently needed (among others government house and the Perth town-hall) were erected.

Apart from the convict system, the most important phase in the history of Western Australia during the sixties was the attention paid to exploration, more particularly of the area north of Geraldton to which the term 'north-west' is popularly applied. Beyond the explorations of King and Grey little was known of that territory until 1861, when F. T. Gregory's expedition inland from Nickol Bay resulted in the discovery of large areas of splendid pastoral country. The publication of Gregory's report, both in Western Australia and in the eastern colonies, soon attracted a large number of pastoralists. Pastoral associations were formed in Perth and in Melbourne to exploit the new country, and the Western Australian venture, the Roebuck Bay Pastoral Association, would probably have had some success had not three of the principal officers sent there been murdered at the outset. The Camden Harbour Pastoral Association, formed in Melbourne to take up country round Camden Harbour, was a failure from the start; members had apparently no knowledge of the country apart from that gleaned from the not overtruthful prospectus. The Denison Plains Association, also formed in Melbourne to occupy a more or less indefinite area on the borders of the Northern Territory, never even reached the neighbourhood, but disbanded at Nickol Bay. In spite of the failure of these large co-operative ventures, many of those who formed part of them took up holdings in various parts of the north-west, and in 1868 nearly 6,000,000 acres were held under leasehold and were stocked with 40,000 sheep. Concurrently with this activity in the north-west, the country east and south-east of the settled districts round York was opened up, and at the end of the period under review 11,000,000 acres and over were held under licence.

Owing to its acceptance of convicts, with the consequent large Imperial expenditure in the colony, Western Australia was debarred from taking advantage of the act of 1850 which gave more freedom to the other colonies. When, however, the convict period came to an end, a demand was at once made for representative government, which was granted in 1870, soon after the arrival of Sir Frederick Weld (q.v.) as governor. Weld was a man of progressive ideas, with great experience in colonial affairs, and his administration marked a distinct advance in the affairs of Western Australia. With the help of his representative council he entered upon a definite policy of expansion. In 1870 the construction of telegraph-lines between Perth and Albany, Bunbury, York, and Toodyay was authorized; this was extended to Geraldton in 1874, and in 1875, just before he left the colony, Weld installed the first pole of an overland line between Perth and Eucla, which was opened in 1877. A municipal institutions act and an elementary education act were passed in 1871, and in 1874 the first sod was turned of the Geraldton-Northampton railway—the first public railway; a private line had previously been opened from Lockeville to Yoganup (12 miles) by the Western Australian Timber Company in 1871. The various expeditions of John Forrest (afterwards Lord Forrest) and his brother Alexander—notably the overland trip to Adelaide in 1874—and the explorations of W. C. Gosse, P. E. Warburton, and Ernest Giles (see EXPLORATION BY LAND), also characterize this period.

The improvement in the affairs of the colony following upon the grant of representative government led to a desire for responsible government, and in 1878 the matter was raised in the council by S. H. Parker. His motion, though lost, brought the matter within the sphere of practical politics, and in 1882 the council asked the colonial office to state conditions upon which autonomy would be granted. The colonial office avoided the direct issue, pointing out that a large portion of the colony (especially the north) still consisted of crown lands, which could be more satisfactorily administered if Western Australia remained directly under the crown; it requested, however, a full statement of the colony's affairs, with exhaustive tables and financial returns. This being forwarded, in 1884 the governor was advised that responsible government would not be refused if, at the succeeding election for the legislative council, a general wish for it was decidedly expressed. Up to this time it could scarcely be said that there was any decisive public desire for autonomy, but Lord Derby's despatch went a long way towards creating one, and for the next two or three years the matter was continually in the public mind. In 1888 it became a burning question, prosecuted with such vigour that an enabling act was passed in 1890 and on 21 October of that year responsible government was proclaimed in Western Australia.

Pearling, which had commenced as far back as 1867, was taken up seriously as an industry, and from 1870 onward pearls and pearl-shell became items of increasing value in the list of exports (see PEARLS AND PEARLING). The export of Western Australian timbers—particularly of jarrah and karri, the economic possibilities of which had been recognized early in the colony's existence, and which had figured in the list of exports since 1844—became one of the staple industries, and together with pearl-shell, sandalwood, and wool, constituted 90 per cent of its external trade. In 1879 railway construction was definitely entered upon as a factor in development. A line from Fremantle to Guildford through Perth, authorized in that year, was opened for traffic in 1881; by the middle of 1886 it had been extended to Beverley, and a branch line had been constructed as far as Northam. Two years later a second branch was opened to Toodyay. By this time the possibilities of the colony had attracted the attention of outsiders, and offers were made by companies to build railways on the land-grant system from Beverley to Albany, Midland Junction to Geraldton, and Perth to Busselton. Ultimately the proposal of Anthony Hordern to

build a line from Beverley to Albany, and that of John Waddington for a line from Midland Junction to Walkaway near Geraldton, were accepted. The Beverley-Albany section (known as the Great Southern line) was opened for traffic in 1889 and purchased by the government in 1896. The second line, known as the Midland Railway, was not opened until 1894, and is now the only privately owned line in Western Australia. There was also a considerable expansion of the telegraph-system, all constructed by the government, and by the end of 1889 the capital was in telegraphic communication with all the settled areas. A distinct impetus to the pastoral industry was given by the exploration of the Kimberley district in 1879 by Alexander Forrest (q.v.), which resulted in the discovery of 25,000,000 acres of good pastoral country. Regulations for leasing this were issued in November 1880, and by the middle of 1883 48,000,000 acres had been leased. To make a correct survey of these leases, many of which were larger than some European principalities, was out of the question; the course adopted was to fix prominent points and make traverses of the rivers, so that the work partook largely of the nature of exploration.

One of these survey trips was made in 1883 by John Forrest, accompanied by the government geologist, E. T. Hardman, who reported indications of the existence of gold. In 1884 Hardman confirmed his previous report, and stated that it was possible to secure indications for a distance of nearly 150 miles. This was not the first intimation of the existence of gold. In 1854 Robert Austin, when exploring the Murchison district, reported that round Mount Magnet there probably existed a rich goldfield; but in 1862 E. H. Hargraves (q.v.) was engaged to prospect for six months, and reported that there was no likelihood of gold being found in payable quantities. An offer, made by the government in 1869, of £5000 for the discovery of a payable goldfield stimulated interest, and from time to time indications were reported and even small nuggets picked up. The actual discovery, however, was due to Hardman's reports of 1883 and 1884, which attracted the attention of prospectors from the eastern colonies; a party left Yeeda station at the end of August 1885 for the locality named by Hardman, and its success led to the Kimberley gold-rush of 1886. The field did not come up to the expectations formed of it, but experienced miners, unsuccessful at Kimberley, spread far and wide throughout the country; and then followed those amazing discoveries which suddenly brought Western Australia into fame as one of the great gold-producing countries of the world (see GOLD, DISCOVERY OF). From 1886 to 1905 gold to the value of £58,813,093 was secured in Western Australia, most of it from the famous 'golden mile' at Kalgoorlie. Though the output has declined since that time, the State still produces more than half the annual gold-yield of the Commonwealth, and by June 1925 had provided in all £155,676,178 worth.

The effect of the discoveries upon the colony's progress was startling. Between 1886 (when gold was discovered) and 1900 (when Western Australia entered the Commonwealth) the population increased from 39,584 to 179,708, imports from £758,012 to £5,962,178, and exports from £630,393 to £6,852,054. The acreage under crop, however, did not show the same expansion (64,210 acres and 201,338), and the value of exported wool actually declined from £332,578 to £270,718. With the comparative decline in gold production which began about 1905 the agricultural and pastoral possibilities of the State were more seriously considered, with the result that to-day Western Australia is rapidly increasing her wool and wheat production. In 1905 there were about 220,000 acres under crop; in 1925 there were 2,750,000 acres producing wheat and fodder-crops to the value of £6,515,762, the total quantity of wheat grown during the season being just upon 24,000,000 bushels. During the same 20 years the value of exported wool has increased from £594,872 to £4,237,152.

This great development of the State's resources has been accompanied by an expansion of its public utilities. As paying goldfields were discovered, railway communication was rapidly extended to them, and other railways have extended to meet the needs of new agricultural communities. The somnolent community of 1886 has become an energetic State, equipped with all modern facilities. Water conservation, so necessary in a country not over-endowed with freshwater rivers, has been an especial care of the government. To meet the needs of the eastern goldfields one of the largest water-schemes in the world was commenced in 1898, it is described under WATER-SUPPLY AND SEWERAGE. Ample harbour accommodation has been provided at Fremantle, and small harbours have been created at Bunbury and Geraldton; these, with the great natural harbour of King George's Sound at Albany, provide shipping facilities for the whole of the south-west, and other harbours along the north-western coast from Geraldton to Wyndham meet the shipping requirements of the north-west and the far north.

In secondary industries Western Australia still lags behind the other States—partly because under the federal system of interstate freetrade the competition of the developed industries of the eastern States makes local production very difficult. It is admitted that federation has had its disadvantages for the State, and in 1925 a disabilities commission, appointed by the Commonwealth government, suggested various remedies. The value of federation, however, was brought home to every State during the war of 1914-18, when the Commonwealth as a whole was enabled to do much more than separate colonies could have accomplished. A system of group settlements has been established in Western Australia, which is already giving an impetus to further agricultural development. The population, which in 1921 was 332,732, had risen to 368,027 by June 1925, much of the increase being due to the encouragement of immigration by the Western Australian government in co-operation with the imperial authorities and the Commonwealth government. The annual revenue has risen to £8,381,466, the imports to £12,037,779, and the exports to £13,390,443.

See J. S. Battye's *Western Australia, a History to 1901* (Oxford, 1924); *Western Australia, an Official Handbook* (1925).

J.S.B.

Western Cork-tree. See HAKEA.

Western White-wood. See ATALAYA.

Westgarth, WILLIAM (1815-1889), born at Edinburgh on 15 June 1815, and educated at Newcastle and at the high schools of Leith and Edinburgh, was trained for commerce in the office of George Young & Co. of Leith, who were

Australian merchants. In July 1840 he left Leith for Melbourne, reached his destination on 13 December, and commenced business on his own account as an importer. After a visit to London in 1843 he went into partnership with Alfred Ross (1845); in 1846 he published a book on the Australian aborigines, and in 1848, after a second visit to England, published *Australia Felix, a Historical and Descriptive Account of the Settlement of Port Phillip*. In November 1850 he entered public life as representative of the city of Melbourne (taking the place of Earl Grey) in the New South Wales legislative council; in 1851 he made an unsuccessful attempt to have voting by ballot (q.v.) introduced into the Victorian electoral act. When Victoria became a separate colony he was chosen to represent Melbourne in the Victorian council. In 1851 he became secretary of the Melbourne branch of the Australasian Anti-transportation League, and upheld its cause in the council, introducing in September 1852 a bill that not only excluded convicts from Victoria but forbade the entrance of holders of conditional pardons, and demanded that persons arriving from Tasmania must prove themselves free men, the assumption being that they were convicts. Although Latrobe gave a provisional assent to this measure, the British authorities disallowed it; but public feeling in the colony was so persistent in its favour that Sir Charles Hotham in 1854 was compelled to assent to a rather more stringent version of the bill. Meanwhile, however, Westgarth had resigned his seat in May 1853 and gone to England. Returning towards the end of 1854, he found the colony disturbed by the miners' riots, and was made chairman of the goldfields commission and of the committee that investigated the Eureka Stockade incident (q.v.). In 1857 he returned to England and settled there, directing his attention chiefly to the raising and management of colonial loans. In 1888 he retired from business, revisited Melbourne, and shortly after his return to England died in London on 28 October 1889.

Westgarth's work was of great value to Australian commercial progress. He was essentially a business organizer, and was both first president of the Melbourne chamber of commerce (1851) and a founder of the present London chamber of commerce (1881). Outside pure commerce he interested himself actively in housing and public sanitation, and advertised Australia widely by his writings—which, besides the *Australia Felix* of 1848, include *Victoria, late Australia Felix* (1853), *Victoria and the Australian Gold Mines* (1857), *Australia, its Rise and Progress* (1861), *The Colony of Victoria* (1864), *Personal Recollections of Early Melbourne* (1888), and *Half a Century of Australian Progress* (1889).

Weston, WILLIAM PRITCHARD (1804-1888), born in London in 1804, in the early thirties migrated to Tasmania and settled at Ringwood near Cressy. In the late forties he made himself prominent as an opponent of transportation, and in 1850 was chosen by the anti-transportation association of Launceston to represent it at the Melbourne conference of 1851 (see TRANSPORTATION) and at the Sydney conference that followed. When in 1856 Tasmania obtained responsible government, Weston was elected member for Ringwood in the first assembly, and on 25 April 1857 became premier, though he refused to take charge of any department. This arrangement was quickly found undesirable, and on 12 May he resigned the premiership to Francis Smith (q.v.), retaining his seat in the cabinet during the next three years, and resuming the premiership (still without office) on 1 November 1860, when Smith was appointed to the supreme court. At the end of the following July, however, he finally left office, and the ministry was reconstructed under T. D. Chapman. He then retired into private life, and during his later years resided in Melbourne. He died on 21 February 1888.

Whalebone-tree. See MORACEAE.

Whales, species of the mammalian order Cetacea, of which some 20 have been recorded as inhabiting or visiting Australian seas. Baleen or whalebone whales are represented by four species, of which two are Australasian in their distribution, the other two having a much wider range. Of these the best-known is the Southern Right Whale (*Balaena australis*), which seems to be on an average somewhat smaller than its congener, the Greenland or Arctic Right Whale (*B. mysticetus*), and has shorter whalebone and less oil. From other large southern whales it is to be distinguished by the immense head, the absence of all trace of a dorsal fin, and the absence of grooves in the skin of the throat. A full-grown male attains a length of 60-70 feet. The southern right whale is not confined to the south; it was formerly abundant in the North Atlantic, and occurs also in the North Pacific. This species is generally known in Australian waters as the Black Whale.

The Pigmy Right Whale (*Neobalaena marginata*), a rare form occurring in Australian waters as well as off the coasts of New Zealand and South America, is not more than 20 feet long, and has pale yellow baleen-plates edged with black. A skeleton is to be seen in the Australian Museum at Sydney, as well as a stuffed specimen with a cast of the head; and there are specimens also in the South Australian Museum.

The Humpbacked Whale (*Megaptera boöps* or *M. lalandi*), occurs in all seas outside the tropical and subtropical zones, and is abundant on the coasts of temperate Australia. It reaches a length of 45-50 feet, and is to be distinguished by the system of grooves or flutings under the throat and belly, and the presence of a dorsal fin—which, however, is not very prominent. The southern humpback may be distinct from the northern; if so, *M. lalandi* is its correct name. There is a skeleton in the South Australian Museum. This species is the kind principally taken by the modern whaling gunboats in Australian seas.

Of the rorquals or fin whales (*Balaenoptera*) three species are known to occur in Australian seas. All have at various times been described and named as species distinct from those found in northern waters; but the weight of evidence seems to be in favour of identifying the Australian rorquals with three well-known northern forms, the Blue Whale (*B. sibbaldi*), the Common Finback or Finner (*B. physalus*), and the Lesser Rorqual or Piked Whale (*B. acuto-rostrata*). Rorquals, though whalebone whales, differ from right whales in being longer and narrower in shape, with a smaller head and smaller flippers, in the presence of a small recurved back-fin, and in the occurrence of a system of pleats or furrows below the throat when not distended; the baleen (whalebone) plates are relatively short. The Blue whale is the largest of all whales, attaining, it is said, a length of over 100 feet, and certainly reaching 98 feet

in Australian and New Zealand waters. The general colour is 'dark bluish-grey, with some white spots on the chest, the lower edges and under-surface of the flippers being white.' A skeleton 87 feet long is in the South Australian Museum, and another of almost exactly the same dimensions in the Christchurch Museum in New Zealand. Whalers call this whale 'sulphur-bottom,' because the lower surface shows a well-marked yellowish tinge. The finner, or finback, though large, is more slender and does not attain the great size of the blue whale, rarely exceeding 70 feet in length. 'The colour of the upper parts and the left side of the lower jaw is slaty-grey; while the right side of the lower jaw and the underparts, including the inferior surface of the flukes and flippers are white.' A small stuffed specimen is in the Australian Museum at Sydney. The third species of rorqual known to Australian waters is the comparatively small piked whale, characterized by its pointed muzzle; it reaches a length of 25-30 feet. This kind is also known as the 'Sei' Whale.

The greater number of Australian Cetacea, including the most characteristic forms, belong not to the section with baleen-plates (Mystacoceti), but to that with teeth (Odontoceti). Among these one of the best-known is the large Sperm Whale or Cachalot (*Physeter macrocephalus*), an inhabitant of the open ocean all over the globe, except within the polar areas. The male cachalot appears to reach a length of about 70 feet. Many authors give 60 feet as the maximum; on the other hand, actual measurements of 84 feet have been recorded; but it is not clear whether this measurement referred to the actual length, or to that taken along the curves of the body. The female is much smaller. Its leading features are the large size of the head, the abruptly truncate muzzle, the absence of a back-fin, and the presence of some 25 large teeth on either side of the lower jaw. The cachalot is represented in the Australian and South Australian museums by skeletons; in the Queensland Museum are portions of a skeleton, apparently of this species.

A pigmy member of the sperm-whale group—the Short-headed Sperm Whale (*Kogia breviceps*), which usually reaches a length of only about 10 feet—has been found occasionally in Australian seas, and has been recorded also from New Zealand, Timor, the Cape of Good Hope, and the North Pacific. It has 9 to 12 long, slender, recurved teeth on either side of the lower jaw, and a triangular dorsal fin. A skeleton and a stuffed specimen represent this species in the Australian Museum, a skeleton is in the South Australian Museum, and a skeleton in the Queensland Museum. Another specimen, found at sea and towed into Port Jackson, was very fully described by William S. Wall, curator of the Australian Museum, in a memoir published in 1851 and reprinted in 1887 and again in 1891. The author regarded it as representing a distinct genus, which he proposed to call *Euphysetes*.

The Southern Bottlenose Whale (*Hyperoôdon planifrons*), apparently closely related to the Northern Bottlenose Whale (*H. rostratus*) of the North Atlantic, is known only from a mutilated skull, which was found on the beach of Lewis Island in the Dampier Archipelago.

The beaked whales (*Mesoplodon*) are represented in the Australian region by three species, *M. layardi*, *M. densirostris*, and *M. grayi*, which rarely exceed 18 feet in length. They have a long, narrow snout, and a pair of peculiar teeth on the lower jaw, usually about the middle. In the rare Long-toothed Whale (*M. layardi*) these are elongated and triangular, grow vertically upwards at first on either side of the beak, then upwards over the latter, and may actually meet in the middle, thus clamping the lower jaw to the skull. The long-toothed whale is represented in the Australian Museum by a skeleton and a cast, *M. densirostris* by a skeleton from Lord Howe Island, and *M. grayi* by a skull. In the Queensland Museum is a skeleton of the first species; in the South Australian Museum are skeletons of the first and second species. Beaked whales of the genus *Ziphius* were unrecorded from the Australian coasts—though well known in New Zealand—until 1919, when the skeleton of a *Ziphius* (determined as the cosmopolitan species *Z. cavirostris*) was found stranded near Maryborough. The specimen is preserved in the Queensland Museum.

The widely-ranging and voracious Killer Whale (*Orca gladiator* or *Orcinus orca*), is sometimes seen, usually in small 'schools,' off the Australian coast (see WHALING AND SEALING). It attacks all other whales but the sperm whale, and feeds also on penguins and seals. The largest male killers reach a length of 30 feet. The killer is readily recognizable by its coloration (black above, white below, with a white patch above the eye), its long, nearly vertical back-fin, and its large flippers. There are about 12 large teeth on either side in both upper and lower jaws. The Australian, South Australian, and National (Melbourne) museums possess skeletons. The Lesser Killer (*Pseudorca crassidens*), which has been found on the coasts of Tasmania, New South Wales, and Lord Howe Island, as well as in European seas, has the dorsal fin and the flippers relatively small. A skull of this rare cetacean is in the Queensland Museum.

The Blackfish, Pilot, or Ca'ing Whale (*Globiocephalus melas*), also of wide distribution, is characterized by its rounded (almost globular) head—which is without a distinct beak—its long back-fin, and long, narrow flippers. There are from 8 to 12 small teeth on either side of the upper and lower jaws. The largest specimens are about 20 feet long. A skull of the blackfish is in the Queensland Museum.

W.A.H.

Whaling and Sealing. The New Zealand islands, owing to their more southern latitude, afforded a series of whaling and sealing stations within a very few years after the first whaler gave Australian waters a trial; and they continued to do so long after the South Sea whaler had left the Australian coast and the export of sperm oil—which for a time figured largely in Australian statistics—had dwindled into unimportance. Hobart was an exception. Whalers long survived in that port, and merchants on 'change talked oil at a time when in Sydney wool had become the country's staple. Many years after whaling in Australian waters had ceased, the South Sea captains who cruised on Pacific whaling-grounds would call at Sydney or at Hobart; and the American whalemen, those hardy New England seamen from Nantucket, New Bedford, and other famous ports, were as familiar with Hobart quay or Sydney harbour as they were with anchorages in Honolulu and the Galapagos.

The first Australasian sealing was done at Dusky Sound in New Zealand in 1792-3. In October 1798 the brig *Nautilus* sailed from

Sydney to pioneer sealing in Bass Strait. Her crew spent 5 months on Cape Barren Island. From Bass Strait the sealers worked along the southern coast and as far as Swan River. Sealing in Australian waters lasted a comparatively short time; the extravagant manner in which the animals were killed by the early sealers soon drove their prey further afield, and they betook themselves to the smaller southern islands of New Zealand. Varieties of the species were common close to Australia, and are still common well to the south; but the great sea-elephant (so called because of its long snout), soon deserted Tasmanian waters, where at the beginning of the 19th century it abounded. Sometimes specimens reached 20 feet in length, yielding a quantity of good oil and skins that were of considerable value in Europe. Vessels landed parties of sealers on various islands, who ruthlessly destroyed male and female, young and old, by knocking them on the head with clubs. The oil was then 'tried out' and the skins preserved, the sealing-vessel returning in due course and collecting the products, which were transhipped at Sydney for England.

In July 1790 a sperm whale was seen cruising in Sydney harbour. Boat-crews from the transports went after it with harpoons, but they were inexperienced, and the whale escaped. A few days later a punt was capsized by the whale, which subsequently stranded at Manly, where the blacks killed and ate it. Transports coming out during the winter of 1791 passed large schools between Tasmania and Port Jackson; the master of the *Britannia* assured Phillip that he had seen more whales in that area on one voyage than on the Brazil coast in six years, and Ebor Bunker, master of the *William and Ann*, was even more enthusiastic. After landing their convict cargoes, many of the transports went whaling with energy, but made only small catches, though they were agreed that the animals' feeding-ground was about 50 miles off the entrance to Jervis Bay. Philip Gidley King, coming out in H.M.S. *Gorgon* in September 1791, passed through a school of 50. As for Bunker, he was so impressed with the value of the new industry that in 1798 he persuaded the great whaling firm of Champion to fit out for him the *Albion*—a 362-ton ship armed with 10 guns—to go whaling in Australian waters. She prospered exceedingly. Her first achievement was to make the quickest passage then recorded between England and Port Jackson—3 months and 15 days, in 1799; and she took home 155 tons of oil in 1801, 600 barrels in 1803, and 1400 barrels in 1804.

On 26 December 1797 the 'merchant adventurers in the southern whale-fishery' presented to the British government a memorial asking that their ships should be allowed to put in to refresh at ports and islands in the southern Pacific. Spermaceti whale and seals, they said, were plentiful, and fisheries might be carried on with great advantage at Kerguelen's Land in the Indian Ocean, off the coasts of New Holland, the New Hebrides, New Caledonia, New Zealand, the Philippines, and Formosa; but, owing to the act (Geo. III. cap. 92, sec. 19) for encouraging and regulating southern whale fisheries, they were restrained from proceeding north of the equator and east of 51° E. (i.e. in practice east of Madagascar). The memorial was sent on to the East India Company, which was asked to comply with the request as far as was consistent with its interests. The British government had for many years subsidized the northern fisheries, and the southern whalemen, restricted within certain limits by the East India Company, complained bitterly of the handicap. Charles Samuel and George Enderby, and Alexander and Benjamin Champion, on 1 August 1800 told Lord Liverpool that they had at last succeeded in establishing 'a whale fishery on the coast of New South Wales, two vessels having returned from the coast, one with 170 tons, the other with 120 tons of spermaceti oil—which are sufficient inducements to adventurers to send their vessels direct to that coast for the purpose of whale-fishing.' They asked that they might be permitted to send out goods for their ship-masters to sell, as this would enable the whalers to purchase such provisions as they needed for a voyage of two or three years' duration. The under-secretary advised that their request should be granted, subject to the regulation of prices by the governor until such time as the trade developed sufficient competition to provide against the creation of a monopoly. Governor King in a despatch dated 28 September 1800, favoured the granting of this privilege and the lessening of restrictions imposed by the act mentioned above, and by a minute of the board of trade (30 December 1801) the boundary of the whale-fishing area was extended as requested to between 123° E. long. and 180° E. A proviso was added that the ship's journals should be delivered to the East India Company on the arrival of the vessels in England.

On 5 June 1802 King wrote of the whale and seal industries as 'established;' the *Harrington*, Captain Campbell, had just returned from King Island in Bass Strait full of sealskins and sea-elephant oil. In January 1803 a report from King Island stated that the sealers had in less than a month, killed 50 sea-elephants yielding 6000 gallons of oil, but had only obtained about 6000 skins, as the seals were becoming shy. During this and the succeeding year King sent home frequent reports as to the success of the whalers. As the Americans were beginning to come upon the coast, King issued a proclamation forbidding any foreigners to build any boat or vessel of any kind in Bass Strait. Assistant-surgeon Thomson wrote on 28 June 1804 that in four months of the previous year five ships had returned from New South Wales with cargoes of oil worth altogether £67,500, and that at the time of writing there were nine London whalers on the station, employing about 270 seamen, whose cargoes it was estimated would, in the same period, be worth £121,500. Thomson had then just returned from Sydney to London. When he left Sydney, some local merchants were fitting out small vessels to carry on the trade, and were building warehouses to store the oil. An industrious man who had been a convict had in 1803 sent home 2000 sealskins and eight tons of sea-elephant oil from King Island. The skins brought from 6s. to 14s. each, and the oil from £35 to £42 per ton. Each sea-elephant yielded nearly half a ton of oil. The animals came ashore only at King Island.

On 4 August 1804 William Collins, a master in the navy who came out with Colonel Collins in the *Calcutta* and was appointed harbour-master at Hobart, made a report on the suitability of the Derwent as the headquarters of a whaling-fleet, and supplied a complete plan of campaign. Two or three ships, he said, of about 250 tons each should be fitted with complete whaling equipments and stores and pro-

visions for two or three years, and should be solely employed in the industry, bringing their cargoes to the Derwent. A factory and storehouse in charge of an agent and superintendent should be established at Hobart. The season for sperm whales would be from December to April; for black or right whales, from July to September, since Storm Bay, Storm Bay Passage, Frederick Henry Bay, and the Derwent abounded in black whales during these months —Collins had seen 50 or 60 of them at a time in the shallower parts of the Derwent.

On 14 August 1804, and again on 20 December, King reported that the Americans were seriously competing with local men, and that some American shipmasters had forcibly expelled the local men from the fishing-grounds of the islands adjacent to Tasmania. On 1 November 1805 he complained that there was a great dearth of agricultural labour, owing to the number of men engaged in whaling, but this would not be so serious but for the fact that the American vessels were taking a great many of them. The sealers were merely a gang of men whose chief duty was to land upon an island and club to death as many as possible of the least aggressive animals. Surgeon E. Luttrell wrote on 8 October 1807 that sealing was on the decline, the animals having been frightened from the islands near Tasmania; and within a very short time the industry in Bass Strait had become insignificant, the seals having gone to the southern islands of New Zealand or to remoter islands in the southern ocean. In 1810 Hasselberg, a sealer in the *Perseverance* (owned by Campbell & Co. of Sydney), discovered the Macquarie and Campbell islands. Major Lockyer, the first commandant at Albany, after a visit to the sealers' haunts in 1827, described them as mostly runaway convicts and seamen deserters, no better than pirates, the terror of ships that called for the skins. Kangaroo Island, their headquarters, was, he said, a dreadful scene of villainy, and the sealers in Bass Strait vied with bushrangers in their atrocious treatment of the Tasmanian blacks.

American whalers were far more capable than the British, for the simple reason that their whaling was the organized enterprise of single ports and their seamen sober and well-trained New Englanders. From 1831 onwards American ships were recorded separately; and in the five years that followed, 28 vessels totalling 7115 tons arrived, coming mostly from the South Sea islands, Manila, and New Zealand. Few of these are specified as whalers, but doubtless most of them were such; in 1835, at any rate, four—with a total tonnage of 1110—were noted as being employed in the sperm fishery.

Samuel Enderby, a London shipowner who had done his utmost to establish whaling in the South Seas, tried to form a whaling company in London early in 1848, when the Americans were not receiving a penny in subsidies, while the English were subsidizesd—and still the Americans were far more successful. But during the American civil war Confederate cruisers drove the New Englanders from the fisheries—a blow from which they never recovered.

In war-time many whalers were supplied with letters of marque, and most of the seamen at some time of their lives had seen fighting. *Saunders' Newsletter*, of London, reported on 18 November 1799 that several vessels employed in the fishery on the New South Wales coast had been driven there from the coast of Peru, where Spanish cruisers had captured 15 sail. A year or two later the whalers turned the tables on the Spaniards; Peru was then defended by only one ship and two 14-gun brigs, and the whalers, armed with letters of marque, swooped down on the coast and captured several prizes, which were brought into Sydney and condemned in the prize court.

When Commodore Dance encountered and beat off the French squadron under Linois near the straits of Malacca on 14 February 1805, whalers from the South Seas formed part of Dance's convoy; their names were *William Fenning*, *Brook Watson*, *Young Tom*, *Betsey*, and *Rolla*, and on the last-named were members of the crew which had been shipwrecked with Flinders in the *Porpoise*. Young John Franklin, then a midshipman, was serving on the *Lord Camden*, one of Dance's ships. During the war of 1812-13 the American 32-gun frigate *Essex* and sloop *Young Essex* seriously harassed British whalers in the southern Pacific, but Captain (afterwards admiral) Sir James Hillyar in the *Phoebe* (36 guns) and Captain T. T. Tucker in the *Cherub* (24 guns) after a smart action on 28 March 1814 captured the *Essex*.

In the early forties the Malay pirates became a menace to whalers, as a favourite fishing-ground was between Timor and New Guinea, within the pirates' beat. The whalers also, from motives of economy, put in to refresh at small remote islands, and were often attacked there. The *Pilot* in 1840 chose one of the smaller Nicobar islands, and took no more precaution than if she had been in Liverpool docks; consequently most of the crew were murdered and the ship plundered. In March 1840, the *London Journal of Commerce* stated, the whale-fisheries in the southern ocean were practically abandoned to the French and Americans, because there were too few British warships on the station; the French had four or five large frigates, while England had only the *Alligator* of 28 guns, the *Pelorus* of 16 guns, and two small surveying vessels.

In Tasmania in the early thirties a black whale (they were then very plentiful near Hobart) went 24 miles up the Derwent and was killed at New Norfolk. The Tasmanian export increased between 1827 and 1831 from 179 tons of oil and 168 cwt. of fins to 838 tons and 818 cwt. respectively. In 1841 there were 35 bay whaling-stations in Tasmania, most of them with 4 whaleboats, each manned by 7 men. In 1848 37 whalers were registered at Hobart; their total tonnage was 8616 and their crews numbered 1046, in both respects exceeding the figures for the other vessels attached to the port. In 1859 27 locally-owned whalers, totalling 5901 tons, with crews numbering 680 men, brought their cargoes to Hobart. Then the whaling industry began to perish. In 1870 17 locally-owned vessels were engaged in the trade; five years later there were about a dozen. In June 1896 the barque *Helen* left Hobart on a whaling cruise: she was the last vessel to represent the whaling industry of Tasmania. Within 65 years the industry was born, flourished, and died.

In 1838 the Hentys' whaling-station was flourishing at Portland Bay. In Western Australia by 1840 there were two stations at Doubtful Island Bay, and two on the Swan River (one of them at Fremantle), which had in 1837 exported about £4200 worth of oil, whalebone, and sealskins. This was practically all bay whaling; great expectations were formed of the trade, but it soon died out. In 1842 Benjamin Boyd (q.v.) established the whaling

industry in Twofold Bay, and in 1847 erected Boyd's Tower as a lighthouse for his whalers; but the government objected to this private lighthouse, and no light was ever exhibited in it. Nine sperm whalers sailed out of Boyd Town in 1848, and for that year it was calculated that the return from whaling operations would yield about £42,600—500 tons of sperm oil valued at £36,000, 200 tons of black oil at £4000, and 10 tons of whalebone at £1500. Boat-whaling from Twofold Bay is all that now remains of Boyd's enterprise. Oswald Brierly painted a fine picture of boat-whaling at Twofold Bay, which is now in the national art gallery at Sydney.

Alexander Berry (q.v.) was the owner of several whalers; their headquarters were at Berry's Bay in North Sydney. In Sirius Cove (now Mosman Bay), early in the forties, Archibald Mosman and Captain Bell secured a concession to build a wharf for their whalers, and expended about £7000 in buildings and wharves. Dr. George Imlay and his brother Peter started a whaling-station at Gabo Island in the forties, with Captain John Stevenson, an old whaler, as superintendent. They had previously tried at Jervis Bay and Twofold Bay, but the experiments were failures.

By 1848 whaling in ships owned in New South Wales had fallen off considerably; in 1860 only 12 vessels were employed in the trade, and the total value of the export, including sealskins and tortoise-shell, was only £1785. There were occasional temporary revivals, as in 1875, when two vessels brought in £5298 worth of whale products; but in the sixties and seventies the average number of ships engaged in the fisheries and discharging in Port Jackson was not more than four a year, and the average annual value of cargoes fell from (roughly speaking) about £15,000 to £2000. In 1891 a vessel of 531 tons brought in £1825, but this temporary revival did not last, and whaling (except bay whaling) was practically suspended until in 1912 some Norwegian companies came on the coast with an 8000-ton whaler and three steam gunboats. In that year, beginning in September, they took 158 whales (the largest 85 feet long), which yielded 3500 barrels of oil; in 1913 (May to mid-November) they took 379 whales yielding 16,000 barrels.

W.J.

In November 1923 another Norwegian expedition started from Hobart to exploit the fisheries of the Ross Sea (see ANTARCTICA) with a 13,000-ton mother-ship and five steam whalers; between December 1923 and April 1924 they obtained 17,000 barrels, but towards the end of the year the mother-ship was sunk off Kerguelen Island and the expedition returned to Norway. During the latter months of 1925 the Norwegians again sent their five steam whalers to fish in the Ross Sea, and on 2 March 1926 the whaler *Star 1* arrived at the Bluff, New Zealand, and reported a record catch of 535 whales, despite the bad ice conditions. This catch was greater than the previous year's by 100, and yielded 38,000 barrels of oil.

Western Australia possesses an excellent whaling-field, the fishery at Point Cloates (where there is a large factory for the preparation of whale-fertilizer) having during the last whaling season (1925) dealt with about 650 hump-backed whales, from which about 3000 tons of oil and 400 tons of fertilizer were extracted. The north-western coast provides large numbers of turtles, and a company at Cossack prepares turtle-soup for export. See NEW ZEALAND.

Wheat. The early history of wheat-growing in Australia is narrated under AGRICULTURE. In 1895 the area under wheat (including wheaten hay) was 3½ million acres; by 1924-5 the area harvested for grain alone had increased to 10,818,748 acres—about 67 per cent of the total area under crop. This rapid development was due to the opening up of overseas markets after 1898, when chambers of commerce in the several colonies established definite f.a.q. (fair average quality) standards. Recent yields have been:

1920-1	145,873,850 bushels,	averaging 16.08 bushels per acre
1921-2	129,088,806 bushels,	averaging 13.28 bushels per acre
1922-3	109,454,842 bushels,	averaging 11.21 bushels per acre
1923-4	124,993,271 bushels,	averaging 13.10 bushels per acre
1924-5	164,576,734 bushels,	averaging 15.21 bushels per acre

The average yield for 1860-1925 was 10¾ bushels per acre; the maximum, 16.35 bushels, was recorded in 1866. The net exports of wheat and flour during 1920-5 totalled:

Year.	Wheat. (centals)	Flour. (centals)
1920-1	46,074,428 ..	4,592,964
1921-2	59,968,186 ..	7,193,949
1922-3	18,896,990 ..	7,889,136
1923-4	35,946,166 ..	10,223,032
1924-5	62,122,828 ..	8,959,772

1 cental = 100lb., 1 bushel wheat = 60lb. and makes 42lb. flour. To convert centals into bushels, multiply by ten and divide by six.

Of the 10,818,748 acres under wheat in 1924-5, 3,543,860 were in New South Wales. In this State the chief wheat-growing areas are the northern tablelands from Tenterfield to Tamworth; the central tablelands, with Bathurst as centre; the Riverina from Wagga to the Murray; the western slopes, including Inverell, Dubbo, Grenfell, Forbes, and Parkes; and the western plains, with Nyngan as centre. New methods of cultivation have made it possible to shift the wheat-belt westwards into areas that have only 10 inches of rainfall during the growing-season. The area added in this way between 1904 and 1922 is estimated at 19,500,000 acres; but probably not more than half this total is suitable for wheat-growing.

In Victoria 2,705,323 acres were under wheat in 1924-5; about 95 per cent of the crop was produced in the Wimmera, Mallee, and the northern and western districts. As in New South Wales, the wheat-growing area in Victoria has been extended into regions of low rainfall. Victorian farmers use a great deal of labour-saving machinery, and about 80 per cent of agricultural land is manured.

Wheat-growing in South Australia occupies a more important position relatively to the population than in any other State. In 1924-5 the yield per 1000 of population was 56,691 bushels (Western Australia, 65,602; Victoria, 28,583; New South Wales, 26,519; Tasmania, 1062; Queensland, 3329). South Australia was the first colony to export wheat on a large scale, its over-sea trade in this commodity dating back to the forties, when the average price was 60s. per quarter. The crop is grown chiefly in the Central, Lower North, and Upper North divisions, with 21, 17, and 14 inches of annual rainfall respectively; 2,499,852 acres were under wheat in 1924-5.

In Western Australia wheat-growing has de-

veloped rapidly during recent years, owing to the adoption of dry-farming methods. Generally speaking, the wheat-belt follows the railway from Geraldton to Albany, and is being extended eastward into the drier country along the goldfields railway. In 1924-5 1,867,614 acres were under wheat.

In Queensland, where 189,145 acres were planted in 1924-5, the chief wheat-producing districts are Darling Downs and Maranoa; some is grown in the Moreton and Wide Bay districts, but rust prevents extensive cultivation in the coastal regions.

Tasmania had only 12,954 acres under wheat in 1924-5, but the yield averaged 17.86 bushels per acre, as against 17.51 in Victoria, 12.21 in South Australia, 12.79 in Western Australia, 16.87 in New South Wales, and 14.70 in Queensland. The Tasmanian crop is insufficient for local demands.

Diseases.—The recent expansion of wheat-growing has been made possible by investigation into wheat-diseases and wheat-breding on the one hand and new methods of cultivation on the other. Of diseases, rust, flag-smut, bunt, and take-all are the most serious. Rust has been a menace since the early days, and was chiefly responsible for the failure of the coastal wheat-farms. William Farrer (q.v.) and others have experimented in wheat-breeding with the object of finding rust-resisting varieties; no satisfactory cure for the fungus has been discovered, but many rust-proof wheats have been evolved, so that the damage done in ordinary seasons is negligible—though occasional rust epidemics are very destructive. Another prevalent and often devastating disease is flag-smut, which was first observed in wheat in 1853; in 1923 it was estimated that this disease caused an annual loss of 5 to 10 per cent of the crop. When it appears, early fallowing is essential, so that spores in the soil may be killed before the next crop is sown; rotation with oats is another method of control. Similar remedies are applicable to take-all, which is even more serious over a number of seasons than smut or rust. The most effective fungicide for seed-wheat is copper carbonate, which has been found less injurious than bluestone or formalin; its use in the form of a dry powder was first shown to be effective by Dr. Darnell Smith, biologist to the New South Wales department of agriculture.

Breeding.—Wheat-breeding experiments have been carried on with the object not only of producing disease-resisting varieties, but also of improving the quality of the grain under diverse conditions of soil and climate. Pioneers in this work were Marshall and Leak in South Australia; McAlpine and Dart in Victoria; Bancroft and Bailey in Queensland; Maddox in Tasmania; Gregson and Penny in Western Australia. The most successful breeder was William Farrer. In recent years the work of individuals has been superseded by systematic experiments undertaken by the States, which maintain agricultural schools and experiment-farms and co-operate with farmers working along experimental lines. Intensive work is also done at the universities.

Cultivation.—The Australian dry-farming system, which has made possible the extension of wheat-growing into areas of low rainfall (10 inches in the growing-season), has been evolved gradually as the result of experience. In the spring-time (July and August) the land for next year's crop is ploughed to a depth which depends upon the nature of the soil—about five to seven inches in the Riverina, the Goulburn valley, and South Australia, and three to four inches in the Wimmera and other heavy clay-loams. It is then harrowed and worked down fine with a cultivator or scarifier, and thereafter harrowed regularly after rain to form a mulch; this arrests loss of moisture through evaporation. In addition to this system of 'winter fallow' certain friable soils are suitable for summer fallowing, the ground being cultivated in February or March and kept clean and worked until seeding-time in the following year; the rainfall of about 15 months is thus conserved. Sheep are frequently used to keep the fallow clean, and their droppings help to supply organic matter; indeed, since the rise of the frozen-meat trade, cropping and sheep-raising often go hand-in-hand. On some light soils which, if worked fine, set like cement with heavy rain, the land is left in the rough after ploughing, and only sheep are used to keep it clean. There is a growing opinion that a liberal application of lime to such soils would render them friable and permit the conservation of moisture by the formation of a mulch.

After the first autumn rains, which are anxiously looked for by the beginning of April, the weeds are turned under with a scarifier or skim-plough and the seed is sown with a drill, from 60 to 80 lb. of seed being allowed to the acre, along with 56 to 112 lb. of superphosphate. It has been conclusively proved that better cultivation of the soil allows a greater quantity of fertilizer to be applied, and the amount used is gradually increasing to 2 cwt. per acre. After sowing, the land is harrowed, and sometimes rolled. Many farmers make a practice of feeding down their crops to make the plants stool better, and to provide feed for the stock. Rains may usually be expected in the winter months, but the critical period for the crops is October to early November. The amount of rainfall about this time determines the yield. If the crop is intended for hay, it is cut in November with a reaper and binder; if left for grain, the earliest varieties are ready for harvesting in late November or December, either a stripper or a harvester being used. Rotation of crops is generally adopted, since bare fallowing alone is not economical. The usual rotations are (*a*) bare fallow, wheat, oats, (*b*) bare fallow, wheat, oats, pasture, (*c*) bare fallow, wheat, oats, rape, or peas. When one crop follows another, the long stubble left by the stripper is burnt off; if the land is left in pasture, the straw is worked back into the ground by stock; burning off the stubble is wasteful of humus, but serves to clean the ground of insect-pests and weeds. Oats should follow wheat as often as possible to prevent attacks of 'take-all,' even when a fallow intervenes. Good results have followed the sowing of oats on well-prepared fallow.

Machinery.—The extent of the areas under cultivation and the high cost of labour render the use of labour-saving machinery imperative if farmers are to compete successfully in overseas markets. The financial crisis of 1842-3 and the scarcity of labour led J. W. Bull (q.v.) of South Australia, then the principal wheat-growing colony, to experiment with a threshing-machine to take the grain from the standing straw; his work was followed up by J. Ridley (q.v.), whose 'stripper' revolutionized the industry by reducing the cost of harvesting from 3s. to 3½d. per bushel. This machine not only stripped the heads from the straw but at the

same time threshed the grain by means of revolving beaters, the mass of grain and chaff being thrown into a receptacle at the rear of the machine; from time to time this receptacle was emptied on to a tarpaulin and the contents put through a winnowing machine, which separated the grain from the chaff and delivered the clean grain into sacks ready for market. In 1884 H. V. McKay (q.v.) invented the 'harvester' to combine both stripping and winnowing operations. It strips the heads from the straw by means of a comb somewhat resembling the ordinary sickle-guard; directly above the rear of the comb is a drum, in which a rapidly revolving beater aids the comb in the decapitating process and carries the heads into a threshing-cylinder, which is provided with revolving and stationary teeth, the threshing being more a rubbing than a beating process. The grain and straw then pass to sieves over a vibrating metal table, and imperfectly threshed grain is automatically returned to the cylinder. The straw and chaff are discharged, and the winnowed grain carried to a rotary screen in elevators composed of galvanized-iron cups riveted to an endless leather belt. From this rotary screen the screenings and the perfect grain pass to separate bins.

Another invention which has contributed largely to the development of Australian agriculture by facilitating the opening up of virgin country is the 'stump-jumping' plough, invented in 1876 by R. B. Smith. Before the introduction of this plough—which enables the farmer to open up rough land carrying small stumps and boulders—large areas of scrub-lease land in South Australia were forfeited because of the difficulty of bringing it into cultivation. In 1881, owing to the use of this plough, only 55 out of 426,338 acres taken up were forfeited, the figures for the previous year being 2345 out of 34,245 acres. See STUMP-JUMPING PLOUGH.

Bulk-handling.—The advantage of handling wheat in bulk was early recognized by growers, but the necessary legislation was not passed until 1917. A phenomenal plague of mice attacked the bagged wheat harvested in 1916-17 and caused the collapse of stacks and sheds; further loss was caused by weather and weevils. A royal commission in June 1917 recommended the construction of permanent grain silos of reinforced concrete as part of a systematic bulk-handling scheme. Under the Commonwealth wheat-storage act of 1917 the farmer brings his grain in a bulk waggon to an elevator, where it is weighed and graded; he then drives up a ramp to a platform over the receiving hopper, where by special mechanism the waggon is tilted, the hinged gate opens, and the bulk grain is emptied out in two minutes. Thereafter the grain is handled by machinery only, being raised by an endless chain of buckets and diverted into bins or railway trucks. A similar process empties the truck into the terminal silo, whence it is mechanically discharged into steamers at adjacent wharves. Many country centres are, however, still without necessary facilities for bulk-handling. Wheat handled in bulk does not deteriorate during a long sea-voyage, provided the moisture-content does not exceed 14.5 per cent.

Wheat-pools. Before the war of 1914-18 Australian wheat was sold chiefly in the markets of Great Britain and Europe, sales being effected on what was known as an Australian contract prepared by the London Corn Trade Association. Owing to abnormal conditions during the war, which placed the Australian grower at a great disadvantage because of increased freights and risks at sea, a wheat-marketing scheme was entered into by the governments of the Commonwealth, New South Wales, Victoria, South Australia, and Western Australia for the purpose of realizing to the best advantage the record harvest of 1915-16 and making advances to farmers pending realization. A wheat-board, established to realize the crop and allot freight-space equitably between the States, consisted of representatives of the governments concerned and of the growers, and was assisted by a central advisory board of shippers and local boards in the several States. Overseas sales were arranged through a London committee consisting of the high commissioner, agents-general, and London representatives of the shippers. Advances were made to farmers upon delivery of their wheat at railway stations to agents appointed by the State governments. The wheat-board sold 3,000,000 tons to the British wheat commission at 4s. 9d. per bushel f.o.b. The compulsory pooling scheme, which continued during the war-period, has since been replaced by co-operative voluntary pools controlled by growers' committees. In Western Australia the money required to handle the 1924-5 crop was made available by the Co-operative Wholesale Society Limited of Great Britain. A compulsory pool established in Queensland is administered by a board consisting of five growers with a government appointee as chairman. F.B.G.

Wheel-tree. See STENOCARPUS.

Whip-bird. See COACHWHIP-BIRD.

Whistler. See THICKHEADS.

Whistling Dick. See SHRIKE-THRUSHES.

White, SIR CYRIL BRUDENELL BINGHAM, the son of a Queensland grazier, born at St. Arnaud, Victoria, on 23 September 1876, was educated at the state school at Hendra (a suburb of Brisbane) and subsequently at Major A. J. Boyd's school at Nundah. He entered the service of the Australian Joint Stock Bank at Brisbane in January 1892, and resigned on 2 February 1899. He was appointed provisional lieutenant in the militia in 1896 (lieutenant, 1897) and later joined the Queensland permanent artillery (captain, 1908; major, 1911; lieutenant-colonel, 1914; colonel, 1915; brigadier-general, 1915; major-general, 1917; temporary lieutenant-general, 1918). He served through the South African war as a subaltern in the 1st Commonwealth horse, and, after returning to Australia, in 1904 was aide-de-camp to a remarkable soldier, Major-general Sir Edward Hutton (q.v.) then commander-in-chief of the Australian forces. He was the first Australian officer chosen to attend the staff college at Camberley in England. Here his keen imagination and brilliant intelligence attracted the attention of several prominent British officers, and, at the special request of the war office, he was retained for several years after his course ended, lecturing and training officers and troops of the British divisions in England and Ireland. On his return to Australia he became director of military operations, and in that capacity obtained leave of the minister for defence to draw up, informally, plans for common action with New Zealand in the event of a war affecting the British Empire. These plans were the only ones in existence at the outbreak of the war in 1914 (at which time Major White was acting-chief

of the general staff), and were at once put into force.

General Bridges (q.v.) chose White as his chief-of-staff; together they drew up the scheme and issued the orders upon which the A.I.F. was organized, and White's share in moulding this force was far greater than that of any other officer. With Generals Bridges, Birdwood, and Skeen, White was responsible for the orders governing the operations for the landing at Gaba Tepe in Gallipoli, and as chief-of-staff to Bridges' successor, General Walker, he drew up the plans for the attack on Lone Pine. When Skeen left Anzac with typhoid fever, White was appointed chief of general staff of the Australian and New Zealand Army Corps, and his scheme for the evacuation was adopted and carried through with complete success. After the evacuation he was chiefly responsible for the reorganization of the A.I.F. into one mounted and five infantry divisions. As Birdwood's chief-of-staff, he was mainly responsible not only for planning the Australian operations in France (until May 1918), but for the development of the A.I.F. also. In May 1918, when Birdwood was promoted to the command of the Fifth British army (retaining, however, the administrative control of the A.I.F.), White was transferred with him, acting as chief of general staff until the end of the war. A man of keen intellect, singular firmness and yet gentleness of manner, he was recognized as one of the most brilliant staff officers on the western front; and, since high command was denied to him because of his supreme usefulness in that capacity, he was promoted to military rank higher than that normally held by officers holding similar appointments. Returning to Australia in 1919 as lieutenant-general to advise the Commonwealth government on future military organization, he became chief of the general staff, and was subsequently appointed chairman of commissioners of the Commonwealth public service board. (D.S.O., 1915; C.B., 1916; C.M.G., 1918; K.C.M.G., 1919; K.C.V.O., 1920.) See AUSTRALIAN IMPERIAL FORCE.

C.E.W.B.

White, HENRY LUKE, born at Anambah near West Maitland in New South Wales on 9 May 1860, is the son of Francis White of Edenglassie and Belltrees (both estates in the Hunter valley) who in 1874-5 represented the Upper Hunter in the New South Wales legislative assembly. Henry White was trained for a surveyor, but from 1884 onwards devoted himself to pastoral work, in 1888 joining his three brothers in a firm that managed the family estates. From boyhood he interested himself in Australian birds, and in later life has employed collectors in most of the States, with the result that in 1917 he was able to present to the National Museum at Melbourne a collection of 5000 bird-skins, including many rare and some unique specimens. This gift he has since doubled. He has also presented to the Royal Australasian Ornithologists' Union (see SOCIETIES, LEARNED) £1000 towards its scientific researches, and has enriched its organ *The Emu* with the record of all discoveries made under his auspices. His collection of eggs of Australian birds comprises clutches belonging to nearly 800 species, with a full record of their history, and is unequalled for reference purposes. Another hobby of his is philately (q.v.); he has specialized in Australian postage-stamps, and in 1917 presented to the Mitchell Library at Sydney his collection of New South Wales specimens, adding in 1921 those of Queensland and Western Australia. His daughter, to whom he had given his Tasmanian collection, presented these to the library at the same time.

White, JAMES (1828-1890), born at Scone in New South Wales on 19 July 1828 and educated at The King's School, on his father's death in 1844 took over the management of his several estates, including Edenglassie near Muswellbrook and Timor on the Isis. To these he added Merton, Segenhoe, Belltrees, and others, until he owned the greater part of the Hunter valley above Denman. From 15 December 1864 to 8 May 1868 he represented the district in the assembly; resigning in order to travel, he again contested the constituency in 1872, was defeated, and on 14 July 1874 was nominated to the council and sat there till his death. While a successful pastoralist, developing estates on the Castlereagh and Barwon rivers as well as on the Hunter, White is best known as a patron of the turf; he won at one time or another nearly every important race listed at Australian meetings, owned (among many notable horses) Martini-Henry and Nordenfeldt; and with Chester in 1877 won that much-coveted double, the V.R.C. Derby and the Melbourne Cup. He died at Cranbrook, Rose Bay on 13 July 1890. See RACING.

White, JOHN, of whom nothing is known prior to his entry into the navy, joined H.M.S. *Wasp* as surgeon's mate on 26 June 1778, was promoted surgeon on 20 October 1780, and in 1786 was appointed to H.M.S. *Irresistible,* the flagship of Sir A. S. Hamond, then commander-in-chief at the Nore. This officer on 16 October recommended him to Lord Sydney as an able and adventurous young man well suited to take charge of the medical arrangements in a new colonial venture. On the 24th he was appointed principal surgeon of Phillip's expedition, and, when the First Fleet (q.v.) began to receive convicts, set himself with great energy and some success to give them sanitary surroundings. His notes of the outward voyage were made into a formal *Journal* and published in London in 1790, with 65 plates illustrating the natural history of the new land; a French translation was published in the same year. While his work was always well done, his heart was not really in it, and his views were pessimistic; he described New South Wales as 'a country and place so forbidding and so hateful as only to merit execration and curses,' Norfolk Island as 'only a place fit for angels and eagles to reside in,' and his destiny as 'my fate and that of my fellow-sufferers.' Shortly after the first landing in Port Jackson he adopted a four-year-old blackfellow, and named him 'Andrew Snape Hamond Douglas White.' In 1792 he asked for leave of absence, obtained it in 1794, and reached Ireland on 28 June 1795. In August 1796 he was informed by the colonial office that he must return to the colony immediately or resign his post. Preferring the latter alternative, he was replaced in New South Wales by William Balmain (see HOSPITALS) and, after a few months on half-pay, was appointed surgeon in H.M.S. *Royal William* (1796-1800), to Sheerness dockyard (1800-03) and to Chatham dockyard (1803-20). On 15 January he retired from active service, but remained on the retired list until the end of 1824; a pension of £90 per annum paid him by New South Wales was an item on the colonial estimates as late as 1826. He died in February 1832 at Worthing in England.

W.J.

White, SAMUEL (1835-1880), born in St. John's Wood, London, on 15 June 1835, was the eldest son of JOHN WHITE (1785-1860), who in 1835 bought land in the still unborn colony of South Australia and in 1836 sailed in the *Tam o'Shanter*, reached Holdfast Bay in December, and settled early in 1837 at the Reedbeds. There in August 1838 John White sowed a crop of wheat—the first 'grown in the colony after the proper method of farming, ploughing and harrowing'—and in January 1839 took off 54 bushels to the acre. Barley, oats, peas, maize, and potatoes were successfully grown the same season.

Samuel White and his brother William came to South Australia with the rest of the family in 1842, found that their father had added a station in the south-east of the colony to his other estates, and were set to learn the business of cattle- and horse-breeding. For this life, however, Samuel had no inclination; despite his father's opposition he took every opportunity of cultivating his knowledge of wild birds, and, when John died in 1860, began a series of naturalist expeditions along the Murray, into the interior of South Australia, and in 1867 across northern Queensland. In 1869 and 1872 he visited London and met John Gould (q.v.), with whom he collaborated. In 1878 he again travelled through northern Queensland, and in 1880 cruised through the Aru Islands (in the Arafura Sea) in search of birds of paradise. During this expedition he suffered greatly from exposure, and died in Sydney on 17 November 1880.

White, SAMUEL ALBERT, son of Samuel White (q.v.), was born at Adelaide on 20 December 1870, and educated at the Christian Brothers' College and St. Peter's College, shared the father's love of birds, and in 1887 organized an ornithological expedition along the Murray; later he investigated the birds of Western Australia (1888) and Queensland (1891). After serving with distinction in the South African war (lieutenant, 1900; captain, 1901) he collected rare birds in central Africa, and on return to Australia continued his ornithological survey of the various States. In 1906 he worked in Tasmania, in 1907 on the Tweed River in New South Wales, in 1908 in Victoria; from 1909 to 1916 he was mainly occupied with a complete ornithological survey of South Australia, such as no other State can boast, but found time to investigate bird-life on the Capricorn Islands off the coast of Queensland (1910) and the islands of Bass Strait (1912). In 1920 he published *The Life of Samuel White*. In 1914 he was president of the Royal Australasian Ornithologists' Union; he is also a corresponding fellow of the American Ornithologists' Union, and a colonial member of the British Ornithologists' Union. His wife, ETHEL ROSINA (1876-1926), was born at Adelaide on 28 December 1876, and accompanied her husband in his pursuit of ornithological knowledge on no fewer than 27 expeditions, into almost every part of Australia. Over 1600 miles of these were done on camelback through almost waterless country—constituting probably the world's record for a white woman. She died at North Adelaide, South Australia, on 11 May 1926.

White Ants. See TERMITES.

White Apple. See ENDIANDRA.

White Australia. See IMMIGRATION RESTRICTION.

Whitebait. See JOLLYTAILS and SMELT.

White-beard. See LEUCOPOGON.

White-ear. See DEMOISELLES.

White-eyes. See SILVER-EYES.

White-faces, small perching birds of the genus *Aphelocephala* (*Xerophila*), peculiar to Australia. The genus is usually placed in the family Paridae, the typical members of which are the birds known as tits in Europe and chickadees in America, but it is perhaps more nearly related to the ground-wrens and scrub-birds of Australia.

White-faces, found in the inland districts, are tame little birds associating in small parties, and hopping actively about on the ground or among bushes in search of insects. The four species are all dull-coloured, brown above and dull white below, with a white patch in front of the eyes

Black-banded White-face (*length* 4 *in.*).

from which they derive their name. The Black-banded White-face (*A. nigricincta*) of central Australia has a narrow black band across the breast; the Chestnut-breasted White-face (*A. pectoralis*) of northern South Australia has a broader chestnut band on the chest; the Chestnut-bellied White-face (*A. castaneiventris*), of the eastern areas of Western Australia, has chestnut coloration on the sides. The common White-face (*A. leucopsis*), of inland eastern Australia, is without any of these distinctive markings.

They build large domed nests of grass, moss, dead leaves, and other materials, lined with grass and feathers, with an entrance high up at the side, and lay four or five pinkish-white eggs, covered with reddish spots and smudges.

W.B.A.

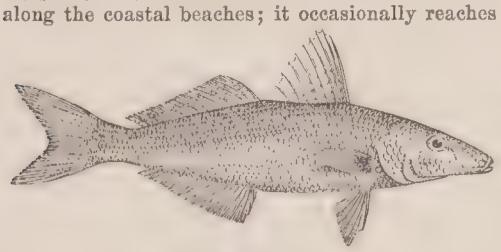
White Shark (*Carcharodon carcharias*), undoubtedly the most ferocious of marine animals, attaining a length of 40 feet and provided with many rows of large triangular teeth, well adapted for tearing flesh. It occurs in all seas, but is apparently more plentiful in the open ocean than near land. It has been known to devour human beings, and the fact that seals have been extracted from its stomach proves that it is as swift in movement as it is voracious. Small examples, eight to ten feet long, are well known from the neighbourhood of Port Jackson, and a Victorian specimen measured 36½ feet.

The teeth are triangular with serrated edges; those of the Victorian example referred to measured a little over two inches in length. Similar teeth, measuring 4" x 3¼", are occasionally dredged in deep water. As they lie loose upon the bottom, they indicate the presence in oceanic depths of far larger sharks than we have record of; the possessors of such teeth must be at least 80 feet in length. Fossil teeth, similar in all details and over six inches long, suggest that extinct species allied to the white shark must have attained a length of well over a hundred feet. A.R.McC.

White-wood. See PITTOSPORUM.

White Yiel Yiel. See GREVILLEA.

Whitings. The practice of utilizing names of well-known fishes of the English markets for Australian species of widely different appearance and affinities alone accounts for the bestowal of the name 'whiting' upon various species of *Sillago*. The whiting of England is a member of the cod family (Gadidae), but the family Sillaginidae is a highly specialized group of perch-like fishes. The nine species occurring in Australian waters are prized as choice table-fish and, though they are usually captured by nets, also afford sport to line-fishermen. The commonest species on the eastern coast is the Sand Whiting (*Sillago ciliata*), which occurs in harbours and inlets as well as in shallow water along the coastal beaches; it occasionally reaches



Sand Whiting.

a length of 18 inches, and commands a ready sale. The Trumpeter Whiting (*S. maculata*) is a northern fish ranging from the tropics southward to Port Jackson; the School Whiting (*S. bassensis*) is commonest along the southern shores of Australia and Tasmania. Another species (*S. bostocki*) supplies the western markets. The Spotted Whiting (*Sillaginodes punctatus*) of southern coasts differs from the others in having very small scales, and in being very closely covered with small blackish spots; it reaches a length of 18 inches. A.R.McC.

Whitington, WILLIAM SMALLPIECE (1811-1887), born at West Clandon in Surrey on 27 February 1811, in 1840 migrated to South Australia in his own vessel, the *New Holland*, taking with him live stock and merchandise; he reached Adelaide in July, and was one of the first merchants in that city. Intending to open a sea-borne trade in stock with Tasmania and New South Wales, he introduced in 1841 two steamships and a brig for the purpose; but the opening of the overland stock-route in 1839-40 practically did away with the need for imports by sea, and Whitington suffered severely. In 1842 he abandoned commerce, which was still unprofitable, for sheep-farming; in 1846 he forsook that for copper-mining; in 1852, when the rush to the Victorian goldfields made it necessary to shut down South Australian mines for lack of labour, he went off himself to the diggings, but soon returned and re-entered mercantile life. From 1860 onwards he devoted himself mainly to mining, but in 1884 was forced by failing health to retire from business, and died on 29 July 1887.

Although in no sense a public man—he refused on several occasions to stand for parliament—Whitington was an excellent example of the adventurous commercial pioneer whose enterprises, if personally unprofitable, were of great advantage to a young colony. He came to South Australia in his own vessel, and imported the first steam trading-vessels; he also in 1840 imported a steam sawmill for use on Mount Lofty, but the local engineering skill was inadequate to get the machinery up. While farming, he imported pedigree bulls and other stock, sporting dogs, game (including deer, pheasants, and peafowls), and the first blood racehorses to enter South Australia—the entire 'Acteon' and the mare 'Falklandina.' His developmental work for the colony's mining in the colony was invaluable. T.G.

Whyte, JAMES (1820-1880), born near Greenlaw in Scotland and brought to Tasmania in 1832 by his father, took a flock across the strait in 1838 and settled at Kononwotong on Portland Bay in Victoria, moving later to Coleraine. The aborigines proving troublesome, he took up a station at Clunes, on which in 1851 a goldfield was developed. He returned as a wealthy man to Tasmania and entered politics, becoming member for Pembroke in the first assembly under responsible government. He was one of the short-lived Gregson ministry of 1857, and became premier of the colony in 1863, holding office till 1866, when his ministry was thrown out on proposals to introduce an income tax. In 1870, as a private member, he carried through a bill for dealing with scab in sheep; in 1876 he left politics and was appointed chief inspector under this act. It was largely due to him that within a few years scab disappeared from Tasmania. He died on 20 August 1880.

Wild Parsley. See APIUM.

Wild White Men. Europeans who have for one reason or another lived with aboriginal tribes for long periods (one did so for 32 years) are known in Australian history as 'wild white men.' The name is not applied to bush-rangers, and is scarcely merited by men who have lived with the aborigines in order to gain ethnological information; it belongs rather to escaped convicts and castaways who lived with the blacks willy-nilly. 'Fain would we picture the home life of this man of the woods,' says a biographer of one of them, writing 70 years ago. 'Dwelling under the smiling skies of Australia, undisturbed in his serenity by the storms of life, honored by sable chiefs and courted by ebon daughters, how enviable his lot!' Unfortunately this conception of the 'noble savage' is as fanciful as those of Pope and Rousseau.

William Buckley, who lived with aborigines in Victoria from 1803 to 1835, and William Jackman, a castaway of less experience and somewhat doubtful veracity, are dealt with under their own names.

Probably the earliest white blackfellow was JOHN OR JAMES WILSON, about whom scant particulars are available. In Collins's *Account of the English Colony in New South Wales* (1798) he is described as a wild, idle young man who —his term of transportation expired—preferred life among the Hawkesbury River natives to 'earning the wages of honest industry by work-

ing for settlers.' He had devised a language intermediate between his own and theirs, with which he made shift to comprehend something of what they wished him to communicate; for the natives were voluble about the injuries which had been done them, and wanted the English authorities to know their side of the case. The tribe with which Wilson associated called him Bun-bo-e. The gratification of an idle disposition seems to have been his sole object in herding with them; but at least he was the means of saving Charles Grimes, the deputy-surveyor-general, from a native attack. On that occasion he was brought back to Sydney, but presently escaped to the woods again with 'another vagabond' named Knight. About the middle of August 1795 Wilson and Knight created an uproar by attempting to abduct a white girl from the settlement; they were captured and punished, but soon escaped and rejoined the natives. Eventually Wilson appears to have been reclaimed, for in 1798 he distinguished himself by attempting to cross the Blue Mountains (see EXPLORATION BY LAND).

JAMES MURRELLS (1824-1865), usually known as Jemmy Morrill, was born at Heybridge in Essex, went to sea at 16, and in 1846 was an able seaman in the *Peruvian*, which sailed from Sydney on 24 February bound for China and was wrecked off the coast of Queensland. Of the 21 people on board only seven reached land, after 42 grim days on a raft; three died within a few days, and the other four were captured by blacks. The natives carried a sickly sailor with gentleness, and treated the other members of the party well. One of the castaways, a boy, soon died, and after several months of wandering the captain died also, followed four days later by his widow; Murrells by this time had been transferred to another tribe near Port Denison. Some years later he saw a barque going north, but could not attract attention. On other occasions he heard that boats had come ashore from some vessel, but, when the blacks did their best to notify the white men that a white boy was with them, they were misunderstood. As settlement extended northward, the castaway heard of the arrival of white men in the neighbourhood, and searched it until he found a sheep-yard on the Burdekin River. He hailed its occupants with 'What cheer mates,' adding, when they seemed likely to shoot him, 'Don't shoot, I'm a British object.' At the hut he was told that the date was 25 January 1863, so that he had been with the blacks for 17 years. Returning to his tribe, Murrells told them he was going away; whereupon, he narrates, 'the man I was living with burst into tears, so did his gin and several other gins and men; it was a wild and touching scene. . . . There was a short, sharp struggle between the love I had for my old friends and companions and the desire once more to live a civilised life that may be better imagined than described.' The tribe begged him to arrange that it should live undisturbed north of the Burdekin, on the low swampy ground near the sea where root-food was to be obtained. Murrells then passed through Bowen and Rockhampton to Brisbane. Everywhere he was an object of keen public curiosity, subscription-lists were drawn up for him, and Governor Bowen received him several times. His teeth were worn to the gums through use on rough food, and he found great difficulty in recovering his knowledge of English. Later he returned to Bowen, was made a custom-house official, and died there on 30 October 1865.

A Sketch of a Residence among Aborigines of Northern Queensland for Seventeen Years, by J. Morrill (Brisbane, 1863), summarizes Murrells's adventures; Edmund Gregory's *Narrative of James Murrells' (Jemmy Morrill) Seventeen Years' Exile among the wild Blacks of Northern Queens'and* (Brisbane, 1896), and a notice in Bonwick's *William Buckley, the Wild White Man of Victoria* (Melbourne, 1857) should also be consulted.

The story of JAMES BRACEFIELD (or BRACEFELL) and JAMES DAVIS is better known than that of Murrells because they are mentioned in *Tom Petrie's Reminiscences* (Brisbane, 1904) and in Russell's *Genesis of Queensland* (Sydney, 1888). They lived with the Wide Bay blacks about the same time—but not together—and were rescued by Andrew Petrie (q.v.) in 1842. Petrie had heard that fugitives from Moreton Bay were in the neighbourhood of the Mary River, and made it his business to find them. When Petrie's name was mentioned to him by the blacks, Bracefield readily came forward, for they had known each other in Brisbane. 'When I spoke to him,' wrote Petrie, 'he could not answer me for some time; his heart was full and tears flowed, and the language did not come readily to him. . . . He was anxious to hear about the settlement and to know whether anything would be done to him; I assured him that no punishment would be inflicted on him.' Through Bracefield (known to the blacks as Wondi 'the great talker') Davis was found soon afterwards. 'I shall never forget his appearance when he arrived at our camp,' wrote Petrie, 'a white man in a state of nudity and actually a wild man of the woods, his eyes wild and unable to rest for a moment on any one object; he had quite the same manners and gestures that the wildest blacks have got.' As with Bracefield, Davis's first coherent sentence was an inquiry regarding the settlement he had deserted about 16 years before. Petrie persuaded Davis to board his boat, and the blackfellows set up an extraordinary lament for their departing tribesman; his native 'father' chanted to him in a deep voice, and a scattered choir took up the refrain; Davis replied in a tremulous whine, while the white men looked and listened in silence. Some hours later, though still unable to speak English, Davis amazed his fellow-voyagers by breaking into Scottish songs; he came, it appears, from Glasgow, where he had been sentenced to transportation when a boy of 13. Great interest was taken in the two 'wild white men' on their arrival in Brisbane, and for hours on the first night they were encouraged to sing aboriginal songs. Afterwards they became reticent, and Davis repeatedly said: 'If you want any information about the blacks, take your clothes off and go and live with them, as I did.' Each received a ticket of leave, and settled down to a more or less civilized life. Bracefield was killed a few years later by the fall of a tree, but Davis lived to old age, and his portrait was painted after his death by Oscar Fristrom in 1889.

JOSEPH FORBES and JOHN EDWARDS, long lost to civilization, were indirectly associated with the loss of the LADY NELSON (see EXPLORATION BY SEA and NORTHERN TERRITORY). The *Lady Ne'son* sailed from Melville Island in February 1825 to procure fresh provisions; she was captured by pirates off the island of Babar (one of the Serwatti Islands) and the whole crew was murdered. A few months later the schooner *Stedcombe* sailed from Melville

Island to procure buffaloes from Timor and also to search for the *Lady Nelson*; she was captured by pirates off Timor Laut, about 60 miles eastward of Babar, and all hands were murdered with the exception of two boys, Forbes and Edwards. Fourteen years later the master of a Dutch trading-vessel reported having seen an Englishman on Timor Laut; Captain Thomas Watson of the schooner *Essington*—in his youth protegé of the widow of Captain Cook—decided to attempt a rescue and on 31 March 1839 stood in for the island. His plan was to entice a chief on board and hold him as a hostage until the Englishman was produced; the ruse succeeded, the captive being brought to the *Essington* next day. He was of fair complexion and his hair was 'triced up in native custom with a comb made of bamboo;' his only garments were a kind of vest without sleeves and a blue-and-white dungaree girdle round his loins; his body was covered with scars and sores and he was almost unable to walk; his ears had been pierced, and in the lobe of each he wore a piece of bamboo at least an inch in diameter. Making himself understood with difficulty, Forbes (for it was the sole survivor of the *Stedcombe*) explained that he and Edwards were the only ones spared by the natives; they were kept as slaves, and Edwards died about four years previously. The scars were caused by natives, who, when he incurred their displeasure, would place hot embers on his body. When a vessel hove in sight, the chief had him bound and kept out of the way, and therefore Owen Stanley did not see him when there in H.M.S. *Britomart*. Some of the crew of the *Charles Eaton* (wrecked in Torres Straits later) were refused permission to take him away, and a Chinese trader who offered several 'gown pieces' for him also failed. Forbes gave many accounts of ships having been cut off by pirates, but his stories were confused and incoherent. He was taken to Sydney and put in hospital, and the British government rewarded Captain Watson. Forbes —'Timor Joe' as he was now called—subsequently settled at Williamstown in Victoria, and died there in 1876. See *Transactions* of the Historical Society of Australasia, vol. 1 (Melbourne, 1886), and Lee's *Logbooks of H.M.S. Lady Nelson* (London, 1915).

CARL LUMHOLTZ (1851-1922) was no castaway, but lived for a year with aborigines in northern Queensland. The son of a captain in the Norwegian army, he was trained for the Church and took his degree in theology at Christiana, but the 'call' to exploration was the stronger, and he came to Australia in 1880. After spending a few months in Victoria and New South Wales, he lived from November 1880 to August 1881 at the Archers' Gracemere station near Rockhampton and thence penetrated 800 miles into western Queensland. From August 1882 to July 1883 his headquarters were on the Herbert River in northern Queensland; there his chief purpose was to fit himself 'to present a faithful picture, based on my own observations, of the life, manners and customs of the Australian aborigines from their birth and infancy to their old age and death.' He made many expeditions with the blacks. 'I began,' he says, 'with the nearest tribes and worked my way up through these to the more remote ones, until at last I lived with natives of Australia who had never come into contact with the white man,' who went about stark naked and ate their defeated enemies. He also did valuable zoological work, his chief discovery being the tree-kangaroo (q.v.) named by Professor Collett *Dendrolagus lumholtzi*. Returning to central Queensland, he spent some time at Coomooboolaroo cattle-station before returning to Europe. Expeditions in various parts of the world followed, notably in Mexico and Borneo; in later years he planned an expedition to New Guinea, but died at Saranac Lake in New York State on 5 May 1922. Lumholtz's Australian experiences are narrated in his book *Among Cannibals* (London, 1889), which is an abridged translation from the original work, *Blandt Menneskeaedere*, published at Copenhagen in 1888. A French translation was published in 1890.

A.H.C.

Wilga. See GEIJERA.

Wilkins, GEORGE HUBERT, was born at Mount Bryan East, South Australia, on 31 October 1888. Educated at a state school, his desire was to become a singer; but, by the wish of his parents, he went to the Adelaide school of mines and received some training as an engineer. Animated, however, by a desire to travel, he 'stowed away' on a steamer for Sydney, and on arrival obtained a position as electrician for a cinematograph firm. Perceiving in this business an opening for adventure, he went to France where he was engaged by the leading firm of film-makers as its special cinematographer with the Turks in the Balkan war of 1912-13. He succeeded in reaching the front, and obtained genuine pictures of battle and of the Turkish retreat. The resulting film, in contrast with the current 'faked' pictures, established his reputation. In 1913 he became a member of Stefansson's Canadian Arctic expedition of 1913-17. He joined it as photographer and cinematographer, but his courage and resourcefulness were such that he was appointed second-in-command by Stefansson, and made an honorary lieutenant-commander in the Canadian navy. During this expedition, the storeships being lost, Wilkins and his leader learned to 'live on the country' in the manner of the Eskimos, of whom they made a valuable study during several months' residence with them. In 1917 one of the expedition's ships brought news of the war, and Wilkins hurried back to Australia and obtained a commission in the flying corps. Being prevented from flying at the front by a supposed defect in his eyesight, he was appointed official photographer (at first under Captain Frank Hurley). Determined to obtain for Australia a photographic record of every action, he was always to be found where there was fighting, and was twice decorated—on the second occasion for rallying American troops at the battle of the Hindenburg Line on 29 September 1918. After the war he attempted to fly from England to Australia in a Blackburn 'Kangaroo' aeroplane, but the machine was wrecked in Crete. He subsequently went to the Antarctic as second-in-command of Cope's British imperial expedition (1920-1); accompanied the Shackleton-Rowett Antarctic expedition in the *Quest* (1921-2); conducted on behalf of the British Museum, as naturalist, a scientific expedition in Australia and the neighbouring islands (1923-5); and in 1926 organized and led an American attempt to fly over the Arctic from Point Barrow in Alaska.

C.E.W.B.

Wilkinson, CHARLES SMITH (1843-1891), fourth son of the David Wilkinson who was associated with George Stephenson in designing the first locomotive, was born in Northamptonshire in 1843, and educated at Ebly in Gloucester-

shire and at Fenner's school in Melbourne. His father settled in Melbourne in 1852, and in 1859 young Wilkinson joined the Victorian geological survey, assisting in surveys of the Bass Strait to Ballarat area (1861), Cape Otway ranges (1863), and Leigh River goldfield (1866). In the last-mentioned year he became government geologist of the colony, but resigned in 1868. In 1872 he became a licensed surveyor in New South Wales, and examined the newly discovered tin-mines of New England; in 1874 he was taken into the lands department, and transferred with other geologists to the mines department in 1875, becoming government geologist. From that time he devoted himself to research among fossils, and his valuable discoveries in the New South Wales gold-drifts and coal-measures brought him not only the praise of high authorities but the naming after him of a genus and several new species. Most of his work is embodied in official reports or addresses to learned societies (he was F.G.S., 1876; F.L.S., 1881; and in New South Wales president of the Linnean Society in 1884 and of the Royal Society in 1888); a list of his papers is given in Etheridge and Jack's *Australian Catalogue*. He died in Sydney on 23 August 1891.

Williams, Sir Edward Eyre, son of a Trinidad planter, but born in England, was called to the English bar in 1833 and soon afterwards migrated to Melbourne, where he practised his profession contemporaneously with William Stawell and Redmond Barry. He was a member of the Bourke district council from 1844 to 1851, and solicitor-general of Victoria for three months in 1852; in 1851 he was made commissioner of the court of requests, in January 1852 chairman of quarter sessions, and in July of that year third puisne judge of the supreme court of Victoria. This position he retained for 22 years. He resigned in 1874 and returned to England, where he died at Bath on 4 June 1880. (Kt. Bach., 1878.)—His second son, Sir Hartley Williams, was born at Collingwood in Victoria on 15 October 1843, educated at Repton and at Trinity College, Oxford (B.A., 1865), called to the bar at the Inner Temple in 1867, and returned to Victoria to practise his profession. Like his father he dabbled in politics but made the law his first interest; he was a puisne judge of the Victorian supreme court from 1881 to 1903, when he resigned and returned to England. His pamphlet *Religion Without Superstition,* published in Melbourne in 1885, ran through several editions and stirred up an unusual amount of controversy in the religious life of the colony. (Kt. Bach., 1894.)

Williamson, James Cassius (1845-1913), born at Mercer in Pennsylvania on 26 August 1845 and locally educated, at the age of 16 joined a 'stock' theatrical company at Milwaukee, travelled with it in Canada, and in 1864 reached New York, where for seven years he played dialect and comedy parts under the management of the elder Wallack. In 1871 John McCullough took him to California for similar work; there in 1873 he married an actress of the company—the well-known Maggie Moore—and with her came to Australia in 1874, opening with *Struck Oil,* his own adaptation of a play that he had bought from an old Californian miner. In 1875 he took his company to India and Egypt, and in 1876 reached London, where he played for a year at the Adelphi, *Struck Oil* running for 100 nights. After a two years' run of the same play in the United States Williamson returned in 1879 to Australia, bringing with him several of the Gilbert and Sullivan operas. George Musgrove was at the time managing a comic opera company, and Arthur Garner an English comedy company; in 1882 the three managers formed the famous 'triumvirate,' which introduced to Australia Sarah Bernhardt, J. L. Toole, Nellie Farren and the Gaiety company, Dion Boucicault, Robert and Florence Brough, and many other celebrated English and American 'star' actors. It was not always a triumvirate; Musgrove withdrew in 1890, Garner was bought out in 1891, and Musgrove rejoined in 1893. From 1900 to 1904 Williamson had sole control; then he formed a new company, which soon acquired almost complete control of the Australian stage, partly by absorbing competitors as they came forward. Williamson died in Paris on 6 July 1913, while on a visit to Europe to engage fresh artists for his companies. See Drama, and Moore, Maggie.

Willis, John Walpole (1793-1877), son of William Willis, a captain in the 13th dragoons (some authorities make him son of Francis Willis, rector of Wapping, but this is incorrect), was born on 4 January 1793, educated at Charterhouse and Trinity Hall, Cambridge, and called to the bar in 1817. Having published two treatises —on equity and on trusteeship—he was in 1827 made a puisne judge in Canada, then in a state of social turmoil. Plunged into an atmosphere of dissensions, he quarrelled persistently with the attorney-general, defied the governor, and was removed by him from office. The British government at first supported the governor, but afterwards held that Willis had not been fairly treated, and gave him a judgeship in Demerara. The climate not suiting him, he was in 1837 transferred to New South Wales. Here he was described by a fellow-judge as 'fidgetty, restless, and self-opinionated;' but Roger Therry, who practised before him, considered him a sound equity judge.

In 1840 a branch of the New South Wales supreme court was established in Melbourne, of which on 1 January 1841 Willis was appointed judge, chiefly because his fellow-judges in Sydney wished to be rid of him. His term of office there was marked by continual friction with officials, counsel, suitors, and the Sydney authorities. At last he commented caustically on a decision of the supreme court at Sydney, which had reversed a ruling of his, and in June 1843 Governor Gipps removed him from office. Willis left Melbourne on 13 July, and on arrival in England petitioned the privy council against Gipps's order. After three years it was again decided that he had been unfairly treated, though the dismissal was in itself just; he was therefore finally removed from office, but was paid his salary for the interval between the first and second dismissals. He then retired into private life, and published a book, *On the Government of the British Colonies* (1850), in which he advocated giving the colonies the status of English counties with representation in the British parliament. He died in England on 10 September 1877.

Wills, William John (1834-1861), born at Totnes in Devonshire on 5 January 1834 and educated at Ashburton school, at the age of 16 went to study medicine at Guy's and St. Bartholomew's hospitals, and in 1852 was sent out with a brother to Victoria to acquire colonial experience. The next year his father also mi-

grated and the two settled down to practise medicine at Ballarat. But bush life had its charms for the younger man, and in 1855 he obtained work with the local surveyor of crown lands, and showed such aptitude that in November 1858 he was appointed to the staff of the newly-founded meteorological observatory at Melbourne. At the moment Melbourne was excited over a proposal to fit out an expedition for the exploration of central Australia; it was in the end organized under the auspices of the Royal Society of Victoria, with Robert O'Hara Burke (q.v.) as leader, and Wills—who had always shown great eagerness to be employed on real exploration—was made its astronomer and surveyor. The full story of this fatal expedition is told under EXPLORATION BY LAND; it suffices to say here that it left Melbourne on 20 August 1860, that Wills after a few weeks became second in command, and that from Cooper's Creek (which they had reached on 11 November) Burke and Wills, with two other white men—Gray and King—started on 16 December in a desperate effort to reach the northern coast of the continent. They reached the tidal waters of the Flinders River on 12 February 1861, struggled back through heavy rains to the Cooper's Creek depot, found it deserted, endeavoured (against Wills's advice) to make their way down the creek towards Adelaide, and for the lack of bushcraft starved to death. Gray had died before they reached the creek. Wills succumbed about the end of June, and Burke about the same time. The only survivor was King, whom Howitt discovered living with an aboriginal tribe on 15 September.

Wills's one defect—if that it may be called—was an extreme modesty, which prevented him from asserting his views on the conduct of the expedition in opposition to the more dominating but far less experienced Burke.

Willson, ROBERT WILLIAM (1794-1866), born at Lincoln in England on 11 December 1794, educated at Oscott, and ordained priest on 16 December 1824, was first stationed at Nottingham, where he procured the building of the cathedral of St. Barnabas and other important ecclesiastical structures. In 1842 he was offered the just-created see of Hobart in Tasmania, which he at first refused, but accepted on reconsideration. He was consecrated on 28 October of that year, but—thinking it best to visit European prisons and acquaint himself with their conditions before undertaking work that would lie largely among prisoners—did not reach Hobart until 11 May 1844. Financial difficulties arising out of this delay embarrassed his administration for many years; they are fully narrated and discussed in Birt's *Benedictine Pioneers in Australia* and O'Brien's *Life of Archpriest J. J. Therry*. The work, however, for which he will always be gratefully remembered lay mainly among the convicts of Port Arthur and Norfolk Island; he brought about many reforms and visited England in 1847 to plead for further improvements; in the end he succeeded in having the convict prison at Norfolk Island abolished altogether. His work for convicts and for the insane was warmly acknowledged by both the Tasmanian and the British governments. In 1859, feeling the stress due to failing health, he petitioned Rome for a coadjutor, but obtained no relief. On 27 February 1865 he left Hobart for Rome, but was stricken with paralysis on the voyage and retired to his old home at Nottingham, where he died on 30 June 1866, having been translated to the titular bishopric of Rhodiopolis *i.p.i.* eight days before his death.

E.M.O'B.

Willy Willy. See METEOROLOGY AND CLIMATE.

Wilson, EDWARD (1814-1878), born at Hampstead and trained for commercial pursuits, after some years of clerkship in London migrated in 1842 to Port Phillip. He began by purchasing a farm on the Merri Creek, but in 1844 joined J. S. Johnston in a cattle-station near Dandenong. While managing this he wrote some letters to the Melbourne press attacking Superintendent Latrobe, and was encouraged by their success to take up journalism as a profession. In 1847, joined by Johnston, he bought the *Argus*, then scarcely a year old, and in 1851 incorporated with it the *Daily News*, which embodied at that time Melbourne's two oldest newspapers. Under Wilson's control the *Argus* in leading articles, for the most part written by himself, combined bitter attacks on Latrobe—whom he never appreciated properly—with strong advocacy of the separation of Port Phillip, the abolition of transportation, and the unlocking of the land for farming, not merely for pastoral pursuits. When Hotham (q.v.) became governor, Wilson at first attacked the administration of the mining laws, but after the Ballarat riots modified his views, and the *Argus* now became the organ of freetrade and moderate conservatism. In 1857 he visited England, leaving George Higinbotham (q.v.) in the editorial chair; on his return he travelled in Queensland, South Australia, and New Zealand, but eye-trouble prevented him from taking part in the management of the paper, and in 1864 he returned finally to England and settled in Kent. There he died on 10 January 1878, leaving the greater part of his wealth to philanthropic objects in Victoria.

He was the founder of the Acclimatization Society of Victoria in 1861, and one of the founders of the Royal Colonial Institute in 1868.

Wilson, FRANK (1859-1918), was born in 1859 at Sunderland in England, and educated in Germany and at Sheffield. In 1888 he migrated to Queensland to become manager of Overend & Co.'s railway and engineering works, but in 1891 went to Western Australia as managing director of the Canning Jarrah Timber Co.; interesting himself in other commercial enterprises, he was for four years president of the Perth chamber of commerce. From 1895 to 1897 he was a member of the Perth city council, and in the latter year entered the legislative assembly as member for Canning, exchanging that constituency for Perth in 1901; in November of that year he joined A. E. Morgan's short-lived ministry as minister for mines, and when the ministry collapsed was defeated at the polls. In 1904, however, he was elected for Sussex, and held the seat till 1917. He was minister for works in the Rason ministry (August 1905 to May 1906); in the Moore administration, which succeeded it, he was colonial treasurer, minister for agriculture, and minister for education from 1906 to 1909, and minister for works from 1909 to September 1910. When Moore accepted the agent-generalship, Wilson became premier until October 1911. Then, his party being defeated and a Labour government under Scaddan coming into power, he was leader of the opposition until 1916, when he again became premier and colonial treasurer. In June 1917 he retired from politics on account of party disagreements. From its establishment until 1916 he was a member of the university senate. He died on 7 December 1918. (C.M.G., 1911.)

J.S.B.

Wilson, JAMES THOMAS, born at Moniaive, Dumfriesshire, Scotland, on 14 April 1861 and educated at the university of Edinburgh (M.B., Ch.M., 1883). In 1885 he was made demonstrator of anatomy in the university of Edinburgh, and in 1887 accepted a similar appointment at the university of Sydney. In 1890 he was appointed Challis professor of anatomy, and occupied the chair until 1920, when he was made professor of anatomy at the university of Cambridge.

He is an able teacher and a man of outstanding ability, and his personal influence, in and out of the classroom, has shaped the lives of hundreds of students. Prior to Wilson's elevation to the chair T. P. Anderson Stuart (q.v.) had been dual professor of anatomy and physiology, and Wilson was thus actually the first professor of anatomy at the university of Sydney. He was chairman of the professorial board, 1908-13; reappointed, 1916-20; dean of the faculty of medicine, 1920; fellow of the senate, 1916-20; pathologist to the Royal Prince Alfred Hospital, 1888-91, director, 1893-7, and honorary secretary, 1898-1900. At the university he carried out such research work as was possible in the time at his disposal, and it is quite likely that the hope of finding more time for original work at Cambridge induced him to leave Sydney. He is a fellow of the Royal Society (1909), a fellow of the Royal Anthropological Institute, a fellow of the Zoological Society, president of the Anatomical Society of Great Britain and Ireland, member of the International Brain Commission, and Membre de l'Institut International d'Embryologie. C.P.

Wilson, JOHN. See WILD WHITE MEN.

Wilson, SIR SAMUEL (1832-1895), son of an Antrim (Ireland) farmer, was born on 7 February 1832 at Ballycloughan, and educated at Ballymena. In 1852 he migrated to Australia to join his brothers, worked for a time on the Victorian goldfields, and finally settled down to station life, commencing as manager of a brother's run and then joining in the purchase of Longerenong station in the Wimmera. This he much improved by a rough system of irrigation, which was shortly afterwards applied to other purchases, including a newly-acquired run at Yanco on the Murrumbidgee. Early in the seventies Wilson sold his Wimmera stations and bought property on the plains between Camperdown and Ballarat, making his headquarters at Ercildoune near Burrumbeet; he was also interested in squatting properties in the Darling district of New South Wales and the Peak Downs district of Queensland. He was a great breeder and acclimatizer, interesting himself not only in sheep but in Angora goats, salmon and trout, and ostriches. He entered the Victorian legislative assembly in 1861 as member for Wimmera, and from 1875 to 1880 represented the Western Provinces in the council; he then went to England and in 1886 entered parliament as member for Portsmouth, but resigned in 1892. In 1874 he gave £30,000 to build the Wilson Hall at the university of Melbourne. He died in England on 11 June 1895. (Kt. Bach., 1875.)

Windeyer, RICHARD (1806-1847), member of a family which has given New South Wales several good citizens. His father, CHARLES WINDEYER (1780-1855), a Staffordshire man of Swiss descent, was the first reporter for the press ever recognized by the house of lords; he was attached to the staff of *The Times*, and was engaged by Disraeli for the *Representative*. In 1828 he migrated to New South Wales with the intention of going on the land, but in the scarcity of colonists with legal knowledge was persuaded to become clerk of petty sessions, and was afterwards made a magistrate. In these capacities he reorganized the whole system of the smaller judicial courts, and was thanked therefor by the council on his retirement. He died in 1855. The Mitchell Library in Sydney has a water-colour portrait of him.—RICHARD WINDEYER, his son, born in London on 10 August 1806, and educated partly in France, also became a parliamentary reporter, supplying reports of debates to *The Times*, the *Sun*, and the *Morning Chronicle*; engaging further in active politics, he was joint-secretary (with Perronet Thompson) of the first anti-corn-law league. Called to the English bar in 1834, he migrated in 1835 to Sydney—arriving on 28 November—where he became a leader of the bar. He also purchased land at Tomago on the Hunter River, not far from his father's farm at Tillegrah on the Williams, and developed it with great skill; he introduced reaping-machines, drained the river-flats, and was one of the first successful vignerons on the Hunter. The financial crisis of 1842, however, affected him severely; and when in 1843 he added to his farm management and his immense legal practice the cares of a legislator, being elected by the county of Durham to the legislative council, his health broke down, he was compelled to retire, and died on 2 December 1847 while on a holiday near Launceston in Tasmania.

His career in the council, though brief, was of high importance. As an associate of Wentworth, and afterwards of Lowe, he attacked Gipps with great bitterness, and was probably the only opponent Gipps feared. In 1843 he carried through the council a measure to relieve landowners by allowing the government to lend them on mortgage half the value of their holdings, but Gipps vetoed the bill; in 1846 he defeated Gipps on a proposal to tax squatters for the upkeep of a border police; he defied the governor's right to assess him for quit-rents, and fought the matter through the courts, being defeated in the end. He was always an advocate of the strictest economy, and of fully representative and responsible government for the colony. Moreover, he was a staunch friend of the aborigines, and in 1845 obtained a select committee of the council to consider their condition, while he strongly supported a bill to make them capable of giving legal evidence. His constructive abilities were also employed in devising bills on which the existing jury and libel laws are founded.

Windeyer, SIR WILLIAM CHARLES (1834-1897), only son of Richard Windeyer mentioned above, was born at Westminster on 29 September 1834 and was only 13 years old when his father died, leaving the family affairs in great confusion. Thanks, however, to the industry of his mother, Maria Windeyer, and to the friendship of Robert Lowe, he was educated at The King's School, Parramatta, and at the university of Sydney, being one of the first matriculants and the first graduate of that body (B.A., 1856; M.A., 1859). He was called to the New South Wales bar in 1857, and became law reporter to the *Empire*; but on 29 June 1859 he entered the assembly, and for the greater part of the next 20 years followed a political career (member for the Lower Hunter, 1859-60; for West Sydney, 1860-62, 1866-72; for the uni-

versity, 1876-79). An ardent Liberal, he advocated the abolition of state aid to religion, the free selection of land before survey, the educational policy of Sir H. Parkes—which in 1878 he extended by carrying resolutions in favour of the establishment of high schools—the volunteer movement for defence (he was gazetted captain of volunteers in 1860 and major in 1868), and the higher education of women. After many refusals of office he in 1870 became solicitor-general in the Martin ministry, and was attorney-general in the Parkes ministries of 1877 and 1878; during his last term of office he carried through acts relating to copyright and married women's property. On 11 August 1879 he resigned office to become a temporary judge of the supreme court, and on 6 August 1881 was made a puisne judge—an appointment which he held for just 15 years. In 1896 he resigned on a pension, and the colonial government submitted his name to represent Australia on the judicial committee of the privy council, but Sir S. Way from South Australia was chosen. Joseph Chamberlain, however, who was then colonial secretary, asked Windeyer to act in an emergency as judge in Newfoundland; but on his way to England he died of paralysis of the heart at Bologna in Italy on 11 September 1897.

Apart from politics and the law Windeyer had many public interests. He was a strong advocate of open spaces for the people, and secured for them both the smaller Sydney parks (in 1862) and several islands in Port Jackson and Broken Bay. His special interest in education was shown not only in parliament, but by his active work for the university (of which he was vice-chancellor in 1883-7 and chancellor in 1895-6), the women's college (of whose trustees he was chairman), the Sydney Grammar School (of which he was a trustee from 1873 onwards), and the Sydney school of arts. (Kt. Bach., 1891.)

Wine. See VITICULTURE.

Wingen, MOUNT, a ridge 1800 feet above sea-level situated among lofty ranges two miles north of Wingen on the main northern railway of New South Wales, 206 miles from Sydney. It rises about 800 feet directly from the valley of the Page River, a tributary of the Hunter. From fissures in the hillside extending over about half an acre of ground are emitted volumes of smoke produced by the combustion of a thick coal-seam of the Greta series (see COAL); mingled with these are the vapours of several sulphur compounds, which coat the heated rock-surfaces in the vicinity with a lemon-yellow deposit. The first recorded observation of this phenomenon was made in 1828 by Archibald Little of Invermein near Scone; acting on his report, in 1831 Surveyor-general Mitchell mapped the district and noted the exact position of the fissures at that date. Since then the burning area has moved slowly southwards up the side of the hill from the hollow in which Little and Mitchell saw it—between 1852 and 1925 it thus traversed about 80 yards, and during the last few years has worked towards the west. W. E. Abbott, who studied the fire continuously from 1852 to 1924, thus described it in 1917:—

> For the last 65 years there has been a gradual dying-down as the fire moved south. . . . During the whole time the fire was moving up the southern slope of the hollow, the rocks to the west of the line kept cracking into long fissures nearly parallel to the line of the fire, and sinking down in steps; and some similar cracks, at right angles to the line on which the fire was advancing, were always forming in advance of the fire just as they are now. This, of course, was caused by the burning-out of the underlying Greta seams . . . the subsidence in places is more than 20 feet.

The point at which it originally started is probably marked by an exudation (diminishing year by year) of sulphurous smoke from a fissure in the side of a smaller hill—the 'Little Burning Mountain'—about 1¾ miles to the north, from which a burnt track extends directly to the area on Mount Wingen. It is supposed that the fire started more than 2000 years ago, possibly from heat generated by the oxidation of sulphur in pyrites (or free); the slow combustion is due to the scanty supply of oxygen underground. Wingen is an aboriginal word meaning 'fire.'

See W. E. Abbott's *Mount Wingen and the Wingen Coal Measures* (Sydney, 1918).

Winstanley, ELIZA. See O'FLAHERTY, ELIZA.

Wireless Telegraphy. See RADIO-TELEGRAPHY.

Wirrah, a fish (*Acanthistius serratus*) of the family Serranidae, with remarkable powers of intensifying and subduing its colour-markings. It is generally spotted with blue on a greenish-brown ground-colour. It lives among rocks, and is recorded from both the eastern and the western coasts of Australia. Though reaching a length of 18 inches, it is of little value as an edible species, being tough and coarse.

A.R.McC.

Wisdom, SIR ROBERT (1830-1888), born at Blackburn in Lancashire on 31 January 1830, brought to Australia by his parents in 1834, and educated at Maitland and at the Sydney College, was a frequent contributor to the *Empire*. In 1859 he was appointed a goldfields commissioner, but resigned the position to become member for Goldfields West in the assembly. From that time till his death in 1888 he sat almost continuously, representing Goldfields West until the end of 1864, the Lower Hunter from 1864 to 1872 (with a few months' interval in 1870 when he sat for Goldfields North), and Morpeth from 1874 to 1888. Admitted to the local bar in 1861, he practised his profession assiduously. From 1879 to 1883 he was attorney-general in the Parkes Ministry; from 1872 to 1874 he was crown prosecutor, but preferred his independence. He was a delegate from New South Wales to the colonial conference of 1887, and soon after his return to Sydney died on 16 March 1888. (K.C.M.G., 1887.)

Wise, BERNHARD RINGROSE (1858-1916), second son of Judge Edward Wise (q.v.), was born at Sydney on 10 February 1858, educated at Rugby and Oxford (B.A., 1881), and after a university career distinguished both in learning and athletics studied law at the Middle Temple and was called to the English bar in 1883. Returning to Sydney, he was admitted to the local bar and took his place as a brilliant advocate, becoming Q.C. in 1898. He was elected by South Sydney to the assembly in 1887 and almost immediately succeeded W. J. Foster as attorney-general in the Parkes ministry of 1887-9. This position, however, he held for nine months only (to 7 February 1888), preferring to practise his profession and at the same time give unofficial support to Parkes both as freetrader and as federationist. For the next 10 years he occupied a singularly isolated

position in the political world, devoting himself mainly to the federation issue (in which he had been interested since 1885) and yet opposing both Barton—on whom the mantle of Parkes fell after 1891—and Reid, who brought the movement through devious ways to a successful issue. In 1897 he was elected one of the 10 delegates to the federal convention of that year; he was placed on the judiciary committee, took a prominent (though still isolated) part in the general debates, and was the author of the 'double dissolution' scheme finally adopted to prevent deadlocks between the two federal houses. When in 1899—after federation had been accepted by five colonies—the Reid ministry was displaced and William Lyne formed a ministry, Wise surprised the political world by taking the attorney-generalship; when Lyne transferred to federal politics and See succeeded him as premier of New South Wales, Wise became also minister for justice; but, when Waddell followed See, Wise (who had hoped to be the next premier) retired from active politics and spent a large part of the next 10 years in England. There he was able by means of speeches and articles to explain to the British people (and especially to politicians) Australian conditions and feelings, which had been much misunderstood, and in this way did the Commonwealth good service. Returning to Australia, he resumed the practice of his profession, but with gravely impaired health; in 1915 he was appointed by the Holman ministry agent-general for his State, but died in London on 19 September 1916.

Wise's chief characteristic was an exceedingly open mind, always ready to discover that he had been wrong and to take up some new cause which he had previously neglected or attacked. This, coupled with a sense of proportion unusual in Australian politics, made him an object of distrust to his colleagues and supporters; thus he was bitterly attacked by freetraders for subordinating his freetrade ideals to his belief in federation, and by federalists for accepting—when federation was safe—office under his old opponent Lyne in order to carry an arbitration act. This distrust is reflected in the details of his political career; he never sat in the assembly for more than three years at a time—for South Sydney 1887-9 and 1891-4, for Flinders 1894-5, for Ashfield 1898-1900 (in that year he was nominated to the council); his adherence to Parkes alienated him from the federationists of the nineties, and his dissensions with Lyne kept him out of the first federal ministry and parliament. Walter Scott (q.v.) wisely said of him: 'Wise has collected the ideal library for a statesman; unfortunately he is always at the mercy of the last book in it he has read.' One of the most brilliant intellects Australia has produced, he lived and died a disappointed man. His two books, *The Commonwealth of Australia* (1909) and *The Making of the Australian Commonwealth* (1913), were written during a period of ill-health and are occasionally careless, but show traces of his earlier brilliancy.

Wise, EDWARD (1818-1865), born in the Isle of Wight on 13 August 1818 and educated at Rugby under Arnold, was called to the bar at the Middle Temple in 1844, and for some years practised on the western circuit. In 1855 he migrated to New South Wales, was admitted to the local bar, and on 19 February 1857 was nominated to the legislative council. From May to September of that year he was solicitor-general in the Parker ministry and from October 1859 to February 1860 attorney-general in the Forster ministry. He was then made a puisne judge, and established a reputation for conscientious diligence. Persistent hard work wore down his health, so that he was compelled to take a holiday—but too late—and died at St. Kilda near Melbourne on 28 September 1865.

In England he had been interested in schemes of social reform, and in New South Wales made many endeavours to procure good literature for public reading. His own library, consisting largely of works on Australian colonization, he bequeathed to the public library of New South Wales.

Withers, WALTER (1854-1914), was born at Handsworth in Staffordshire on 22 October 1854. He studied at the royal college of art in South Kensington and the Académie Julien in Paris, and in 1882 migrated to Melbourne to become a draughtsman with William Inglis and Company. In 1886 he joined the Australian Artists' Association and in 1888 the Victorian Artists' Society (of which he was president in 1904-5); at the end of 1889 he joined Conder, Roberts, and Streeton at Eaglemont (see ART), and when Conder went to England in 1890 established at Charterisville a camp in which Phillips Fox, the Lindsays, and several other noted Australian artists obtained valuable training. In 1897, and again in 1900, he was awarded the Wynne prize at Sydney (see ART GALLERIES). He died at Eltham in Victoria on 13 October 1914. He is represented in the Sydney, Melbourne, and Adelaide galleries. His finest landscape—'Tranquil Winter' in the Melbourne gallery—was described by R. A. M. Stevenson as 'a delicious harmony of colour as natural as it is decoratively beautiful.' 'The Storm,' in the Sydney gallery, deserves equal praise.

Wittenoom, JOHN BURDETT (1789-1856), son of Thomas Wittenoom of London, was born in 1789 at Newark in Nottinghamshire, and educated at Winchester and Oxford (B.A., 1810; M.A., 1813). From 1815 to 1829 he was headmaster of Magnus College, Newark; in the latter year he was appointed chaplain to the civil establishment at Swan River, reached Western Australia towards the end of the year, and erected (partly with his own hands) the first church in the colony. He died at Perth in 1856. —A grandson, SIR EDWARD HORNE WITTENOOM, born at Fremantle on 12 February 1854 was minister of mines and education under John Forrest in Western Australia in 1894-8, acting-premier in 1897, agent-general 1898-1901, and is president of the legislative council. (K.C.M.G., 1900.)

J.S.B.

Wittychu. See DIAMOND-BIRDS.

Wobbegong (also known as carpet-sharks), ground-sharks (*Orectolobus*) of sluggish habit, remarkable for their beautiful colour-markings; these form complex patterns of brown, violet, and lilac, and sometimes resemble the ornate design of a handsome carpet. Wobbegong frequent neighbourhoods in which their markings may blend with weed-covered rocks, so that they may lie in wait unobserved by the fish and crustaceans on which they feed. A fringe of dermal lobes, not found in any other shark, overhangs and partly conceals the mouth, adding further to their camouflage. There are several species in Australian waters, the largest growing to about six feet long, and they are not dangerous to man unless they come by accident

within reach of a wader's foot or hand. A large female carpet-shark contained 37 young, each ornamented with a beautiful pattern similar to, but more striking than, that of the parent; these patterns were in the form of variegated bands. Another common species is marked with rings (ocelli). See SHARKS.

A.R.McC.

Wolfram. See TUNGSTEN and MINERALOGY.

Wombats, a genus (*Phascolomys*) of diprotodont marsupials inhabiting the southern part of the Australian continent and Tasmania. Of the four distinct species the Common Wombat (*P. mitchelli*) is found in New South Wales, Victoria, and South Australia; the Tasmanian Wombat (*P. tasmaniensis*) is confined to Tasmania; the Flinders Island Wombat (*P. ursinus*) occurs on Flinders and Deal islands in Bass Strait; and the Hairy-nosed Wombat (*P. latifrons*) in South Australia. A fifth species, the Queensland Hairy-nosed Wombat (*P. gillespiei*) was described by De Vis in 1900; though it is apparently allied to *latifrons*, the characters are somewhat contradictory; according to Heber Longman it should be regarded as a distinct species, occurring near the southern border of Queensland. All are broad, thick-set animals with a short neck, broad head with short muzzle, very short, thick limbs, and rudimentary tail. The fur is coarse and harsh in the common wombat, finer and silkier in the hairy-nosed species. In the fore-limb the five digits are approximately equal, and all are provided with stout claws; in the hind-limb the first toe is very small and not provided with a claw, whereas the rest have long, curved claws. In its general appearance the wombat resembles a diminutive bear much more than does the koala, to which the name 'native bear' is usually applied.

The dentition is remarkable. Though conforming to the type characteristic of diprotodont marsupials, it is specially modified, and superficially bears a striking resemblance to that of certain rodents. All the teeth grow throughout life, and form no roots. Only two incisors are formed in the upper, and two in the lower, jaw; these are curved, chisel-like teeth, covered with enamel on their front faces only, and separated by a wide space from the rest of the teeth.

In striking contrast to the native bear, the wombat is unable to climb trees; it is an active burrower; during the day it takes shelter in excavations which it makes, issuing forth after nightfall in search of food, which consists of grass, herbage, and roots. See MARSUPIALS and NOXIOUS ANIMALS.

W.A.H.

Wood-borers. Much damage is done to timber in Australia by insects known generally as wood-borers. These may be divided into three main classes:—(1) those which attack living trees, (2) those which infest seasoned timber, and (3) those which confine their attention to unseasoned wood. In general the adult insect lays its eggs on or beneath the surface, and the larvae which hatch out bore their way into the substance of the timber, extracting nourishment from it as they travel in long tunnels. Those that work in living trees often sap their vitality, and in many cases cause their ultimate death and decay. The tunnels vary from minute holes to cavities an inch or more in diameter, and many feet in length, according to the age of the grubs and the species to which they belong. Chief among these may be mentioned the larvae of longicorn beetles (Cerambycidae), wood moths (Hepialidae), jewel beetles (Buprestidae), and certain weevils (Curculionidae); the grubs of the longicorn beetles and of the wood moths are the greatest pests. Some of them when fully grown are large, fleshy grubs which may attain a length of two or three inches. They are often found in eucalypts, acacias, casuarinas, banksias, angophoras, and pines; it is doubtful, indeed, whether any trees are entirely resistant to them. When the trees are felled, the grubs usually die, but occasionally survive for varying periods, and in rare instances have been found alive years after the timber has been sawn and has become thoroughly dry. No satisfactory remedy can be suggested for this class of pest.

Two species of beetle attack seasoned timber, the Powder-post Beetle (*Lyctus brunneus*) and the Furniture Beetle (*Anobium domesticum*). The powder-post beetle appears to have been first recorded from Brazil, whence it has spread by means of commerce all over the world. It has been known in Australia for upwards of 60 years. The beetle is reddish-brown in colour, and varies in length from one-eighth to one-fifth of an inch. It bores its way out of the timber principally during the summer months. Pairing commences as soon as the beetles leave the timber, and in a short time the female deposits her eggs in the pores of the wood. In a week or two minute white or pale-cream grubs hatch out, and begin at once to feed on the wood tissue. Their presence is usually indicated by small heaps of powder coming from pin-holes; but these holes are made by beetles leaving the timber, and not, as is often imagined, by the grubs. The powder-post borer does much damage to hardwoods used in building construction, such as scantlings, flooring-boards, joists, etc., but confines its activities to the sapwood, or outer portion of the log. It also attacks the sapwood of many furniture timbers—e.g. Tasmanian oak, cedar, Pacific maple, Tasmanian myrtle, and silky oak—and may attack rattan furniture, but does not affect sound heartwood.

The furniture beetle is approximately of the same size as the powder-post beetle, but is more rounded in outline. Its general habits are also similar, but important differences exist in the type of wood attacked. It does not confine its attention to sapwood, extensive damage often being done to heartwood. Most furniture timbers are susceptible to its attack, but not hardwoods, especially eucalypts. The furniture beetle is frequently met with in old houses, particularly in floorings, old furniture, pianos, etc.; it has a preference for wood that is old and thoroughly dry, whereas the powder-post beetle shows a partiality for timber soon after it is seasoned.

In external work and structural timber a liberal application of creosote will usually be found an effective deterrent. The effectiveness of creosote is dependent largely on the presence of cresols, carbolic acid, and naphthalene. Creosote from which these fractions have been distilled is of little value. Where it is undesirable that the timber to be treated should be stained—e.g. in the case of furniture and interior fittings—a mixture of creosote (1 part) and kerosene (8 parts) can be used. Orthodichlorbenzene is also an effective remedy, and does not stain the wood. The liquids should, in the case of painted or polished furniture, be injected into the flight-holes with a strong pump or syringe, fitted with a fine-pointed nozzle.

Borers which attack seasoning timbers—'shot-

hole borers,' as they are sometimes called—comprise several species belonging to the genera *Platypus* and *Xyleborus*. They vary from one-sixteenth to one-quarter of an inch in length, and do most damage to recently felled logs and freshly sawn, unseasoned timber. As the wood dries it loses its attraction for these borers, and they cannot live in it when it is seasoned. Hardwoods and cabinet-woods alike are liable to attack. The only effective remedy so far tried is that of steaming in a steam-box; the heat kills the borers in the timber, but does not render it immune from further attack. In order to minimize the risk of infection by shot-hole borers, it is advisable to strip off the bark as soon as possible after the log is felled, so that the surface may dry quickly, and thereby lose its attraction for the beetle. See BEETLES.

See *Wood Borers Damaging Timber in Australia*, by T. C. Roughley and M. B. Welch (Sydney, 1923).

T.C.R.

Wood-engraving, as an art for expressing in black and white lines the various conceptions of its exponents, has had numerous modes of treatment. When Thomas Bewick (1753-1828) was one of the leading wood-engravers, the white line was much used, and recently that method of expression has been in considerable vogue, notwithstanding that both the white and the black line are essential for proper results. When, after 1822, the steam press came into general use, the number of wood-engravers increased with the establishment of illustrated newspapers, and, when the cuts became larger, they necessitated the employment of several hands in order that the work should be done to time. This was accomplished by bolting together several small squares of boxwood into a homogeneous block of the size required. The drawing was made directly on the wood, and the master-graver set the line across each side; it was then unbolted, each piece was given to a separate engraver, and as soon as all were finished the pieces were rebolted. The master-graver added the finishing touches, and the block was sent to the printer. The necessity for speed often precluded the consideration of quality, which in wood-engraving requires particular time and thought. The engraver became skilful in cutting clean lines, and, towards the 1880s extraordinarily able in translating the tones of wash-drawings. He was useful chiefly as a faithful reproducer of the pen and pencil draughtsmen of the sixties—Sandys, Keene, and Rossetti in England, Menzel in Germany, Gustave Doré and Vierge in France.

When Australia, following the lead of the old country, imitated its illustrated journals, there were no such originals to inspire local engravers before Arthur Collingridge. The *Illustrated Melbourne Post* (1862) and the *Illustrated Sydney News* (1866) followed the *Illustrated London News*. The weekly chronicle of news was 'embellished with cuts,' mostly of scenery and local people of importance, with an occasional 'ship on fire' or 'capture of bush-rangers' to enliven the general dullness. The *Punches* of Melbourne and Sydney were mere parodies of the London original. The engravers, Calvert in Melbourne and Mason in Sydney, followed their line originals creditably, but in the translation of wash-drawings, fortified occasionally by line, were almost uniformly cold and mechanical. In this they were not entirely to blame. Their originals were of the poorest, and they had to work cheaply and swiftly—the ruling price in the seventies was half-a-crown the square inch, and they were expected to comhand was used on his brother's drawings.

The American company which produced the *Picturesque Atlas of Australasia* (see ART) brought with it most of its engravers, erroneously supposing that there were none in Sydney. The artists employed were W. T. Smedley and F. B. Schell (from the United States), Julian Rossi Ashton, A. H. Fullwood, and William Macleod. The American engravers, trained in Paris and on the *Century* and *Harper's*, were renowned for the fineness of their cutting (the Germans were better at facsimile work); the distinguishing quality of their school was a smooth, suave technique, full of finesse and attention to colour-values, but undistinguished by individual style such as still persisted in France.

One of the engravers, however, came from a very different school. George Collingridge, working in Paris for the *Monde Illustré, l'Illustration*, etc., had distinguished himself by admirable skill in keeping the quality of Vierge's drawing 'in the wood.' He was also engaged with such master-gravers as Martin and Perrichon to make the cuts (after Vierge) for Michelet's *History of France*. But in Australia there was no Vierge, and Collingridge's skill of hand was used on his brother's drawings.

With the 1880s and the publication of the Sydney *Bulletin* photographic-process engraving came into general use, and a new era in black-and-white commenced with Phil May. Wood-engravers, seeing their craft doomed, in most cases set up photo-mechanical establishments; of these Calvert and Nicklin (one of Swain's best engravers) were the best known. Here and there an old 'wood-pecker' continued to do admirable work, but as a means of reproduction wood-engraving almost disappeared. George Collingridge, however, never ceased working, and he still draws, engraves, and prints his own woodcuts for the various booklets which he himself publishes. In 1895 Ernest Moffit and Norman and Lionel Lindsay made some knife-cuts, wrought, as in Dürer's day, upon the plank. Norman Lindsay's little illustrations to Rabelais are as remarkable for their skill with the knife as for their design. In 1922 Lionel Lindsay produced *A Book of Woodcuts*, and in the following year *Twenty-One Woodcuts*, printed and published by himself. In 1924 Napier Waller exhibited some cuts of poultry and large black-line cuts, romantic in subject-matter and of beautiful quality. Norman Lindsay with delicate woodcuts of the nude that reveal extraordinary skill of hand, Margaret Preston with her deep black-line cuts—rough in texture but admirable in design and colour—George Collingridge, Raymond McGrath, and Roy Davies complete the list of Australian exponents of the cut in 1926.

G.C.

Wooden Pear. See XYLOMELUM.

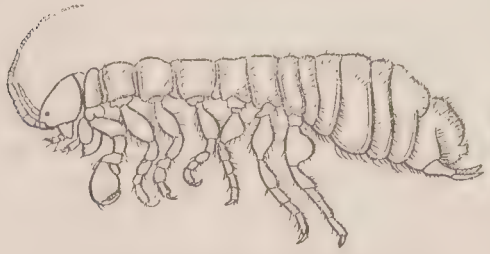
Woodlice, animals belonging to the group Isopoda of the class Crustacea, sub-class Malacostraca, and often grouped with the Amphipoda as 'sessile-eyed crustacea.' The essential differences between the two groups are given under SANDHOPPERS. Although the best-known isopods are the terrestrial forms commonly called woodlice, slaters, carpenters, sow-bugs, etc., the majority of the genera are marine and are known

as sea-lice or fish-lice. Many of them are parasitic or semi-parasitic, being found attached to the gills of fish, the inside walls of the mouth, or other parts. These parasitic forms have usually more or less completely lost the power of locomotion and the sense-organs; one sub-order (Epicaridea), which is thoroughly parasitic, has lost nearly all resemblance to the ordinary typical isopod—though in some species the males, which are very much smaller than the females, are less abnormal in structure.

Isopods are, as a rule, rather larger than amphipods, many fish-lice being as much as two inches in length. The largest one known is a deep-sea form, *Bathynomus*, which attains a length of about 11 inches. As among amphipods, the Arctic and Antarctic forms are often of larger size than allied forms living in warmer seas. A few species are found in fresh water; in the fresh waters of Europe, Asia, and North America there commonly occur species of *Asellus* and other allied genera, and one somewhat similar form has been recorded from Australia. The most interesting of the freshwater forms belong to the sub-order Phreatoicoidea, the first members of which (belonging to the genus *Phreatoicus*) were found as blind subterranean forms—'well-shrimps'—living in the underground waters of Canterbury Plains in New Zealand.

a *b*

Livoneca raynaudi, a fish-louse common on various species of fish in Australian seas. (*a*) dorsal view, (*b*) ventral view.



Phreatoicus australis, a freshwater isopod found in Australia and Tasmania.

This sub-order is now known to include three or four closely allied genera and more than a dozen species, living in underground or surface waters of Australia and New Zealand; one species has been found in the mountain streams of The Cape Colony in South Africa. Rarely these animals are semi-terrestrial, burrowing in the soil. One species occurs in great abundance in central Australia, living in the waters brought to the surface by some artesian bores; the animals do not come up with the artesian water, but are true surface-forms with well-developed eyes. Though the Phreatoicoidea are true isopods, they show considerable superficial resemblance to amphipods. A fossil species of *Phreatoicus* has been recorded from the Wianamatta shales of New South Wales, which belong to the Triassic period.

The terrestrial isopods—sub-order Oniscoidea, or woodlice proper—are much more numerous than the terrestrial amphipods. They are found in all parts of the world, and comprise a great number of genera and species. They are vegetable-feeders, and some species do considerable damage in green-houses and gardens; two of these, *Porcellio scaber* and *Metoponorthus pruinosus*, have been accidentally distributed by human agencies from their original habitat in Europe, and are now found in all countries.

The sexes in isopods are usually distinct. In parasitic forms some degree of hermaphroditism is common, in other cases the male is sometimes very small and lives as a parasite on the female. In parasitic forms, too, complicated changes may occur during development; in other isopods the whole development takes place in the eggs, which are carried in the brood-pouch under the body as in amphipods. In some members of the family Sphaeromidae the young are hatched in brood-pouches formed by invaginations into the body of the female, the mouth-parts and other organs degenerating so that the female dies when the young are hatched.

See Harriet Richardson's *Monograph on the Isopoda of North America* (Washington, 1905); Sars's *Crustacea of Norway* (vol. ii., Isopoda); Webb and Sillem's *The British Woodlice* (London, 1906); Budde Lund's *Crustacea Isopoda Terrestria* (Copenhagen, 1885); and Chilton's 'Subterranean Crustacea of New Zealand' and 'Terrestrial Isopoda of New Zealand' in the *Transactions* of the Linnean Society of London.

C.C.

Woodpecker. See TREE-CREEPERS.

Woods, JULIAN EDMUND TENISON (1832-1889)—sometimes known as Tenison-Woods—son of J. D. Woods, a London barrister and journalist, was born in Southwark on 15 November 1832, and educated at Newington and Balliol College, Oxford, but left the university before graduating in order to join the Roman Catholic Church. Becoming a member of the Passionist order, and finding the English climate a danger to his health, he in 1855 came to Tasmania to work under Bishop Willson. The next year, however, he decided to return to England, but, reaching Adelaide for that purpose, was persuaded by Bishop Murphy to remain with him, take orders (priest, 1856) and work as a missionary on the borderland between South Australia and Victoria. Here he worked for ten years, during which time he prefixed 'Tenison' to his surname as being descended through his mother from the famous Bishop Tenison of Ossory in Ireland. In 1867 he was made vicar general of the Adelaide diocese, and held the position for four years; but he was always restless in a city, and in 1871 took up missionary work in the Sydney diocese, going in 1873 to Queensland. By this time, however, his superiors had noticed his strong leaning towards scientific research—which, indeed, had largely prompted his desire for travelling rather than for steady parochial work—and he was set free to follow his bent, relinquishing parochial work altogether in 1883.

Long before this he had begun to write, his *History of the Discovery and Exploration of Australia* (2 vols., 1865) being his first im-

portant book, though he had previously (1862) published *Geological Observations in South Australia*. His papers on geology and palaeontology are very numerous; he at one time edited two journals for his Church; he furnished to the South Australian government geological plans for railway purposes, compiled for the Tasmanian Royal Society a census of the conchology and palaeontology of the island, and in 1883 was invited by the governor of the Straits Settlements to report on the mineral resources of that region. H.M.S. *Pegasus* was specially detached for this service, and in her Woods explored Java, Siam, Borneo, Malacca, and the Philippine Islands, his report on the coal-fields of the region proving of great service to the British navy.

Returning to Australia in 1886, he reported on the mines of the Northern Territory for the South Australian government, and while travelling for this purpose contracted a fever which undermined his constitution. His last two years of life were spent in Sydney under conditions of failing health, and he died there on 7 October 1889. After his death, in 1892, there was published his last book, *Fish and Fisheries of New South Wales*, which remained for many years the standard work on the subject.

He was a fellow of the Geological Society of London (1859) and of many Australian learned societies; president of the Linnean Society of New South Wales in 1880; and gold medallist of the Royal Society of that colony in 1888.

Wood-swallows, arboreal perching birds of the genus *Artamus* and family Artamidae, a family confined to southern Asia, Malaysia, Australia, Tasmania, and the Pacific islands east to Fiji; its headquarters are in Australia, where six species are found.

The wood-swallows (also known as swallow-shrikes, and in Australia commonly termed martins) show considerable superficial resemblance to true swallows (Hirundinidae), especially when flying. Though occasionally showing a fondness for nectar, they are mainly insectivorous, and capture flying insects in the air, but they perch much more frequently than swallows—usually, like flycatchers, selecting dead limbs as look-out stations. They are sociable birds, generally seen in small parties, though sometimes large flocks of several species assemble. When perched for the night in the non-nesting periods they usually crowd close together, apparently for warmth, and the members of at least one species occasionally hang to a tree for the night in a great cluster like a swarm of bees—a habit unique among birds. Their nests are placed in the forks of boughs or in hollows in the trunks or limbs of trees, or sometimes in deserted nests of the magpie-lark. They are saucer-shaped, consisting of fine twigs and grass, lined with rootlets. The two or three eggs are grayish, spotted, dashed or blotched with markings of brown.

The commonest species throughout southern Australia and Tasmania is the Sordid Wood-swallow (*A. cyanopterus*) commonly known as the Blue or Bush Martin, a dark blue-gray bird with white edges to the wings and tip of the tail. Other widely distributed forms are the White-browed Wood-swallow (*A. superciliosus*), often called the Summer Martin—the most handsome member of the family, slaty-gray above, chestnut below, with a white patch above the eye; and the Masked Wood-swallow (*A. personatus*). Both these species are found throughout the continent, but only as summer migrants in the southern States; neither reaches Tasmania. The White-rumped Wood-swallow (*A. leucorhynchus*) is found throughout eastern and northern Australia and in Malaysia, and the two remaining species occur in inland and northern Australia.

W.B.A.

Wool Industry, THE, began in 1793, when 'about thirty sheep of the Indian breed' arrived from Calcutta and a few English sheep from Ireland. Phillip had bought 'upwards of seventy sheep' at the Cape of Good Hope on his way out, but by September 1788 all but one had died. John Macarthur (q.v.) began experimenting by crossing these breeds, and noted an improvement in the quality of the wool. He soon saw that the introduction of the Spanish merino (grown in England from a flock of George III) would result in still further improvement, and when in 1796 the *Reliance* and *Supply* were sent to the Cape of Good Hope for stores, he asked captains Henry Waterhouse and William Kent to buy any 'fine-wool sheep that offered.' The two captains arrived at the Cape in the midst of certain complications concerning a small flock of merinos, bred from a few which had been presented to the Dutch government by the King of Spain and sent by that government to their colony at the Cape of Good Hope. Matters were settled by selling the sheep, most of which were bought by the captains. Each shipped 13 for the colony in Australia, but apparently the only ones to arrive safely were some of those of Waterhouse. After the government had declined to purchase, Macarthur offered 15 guineas a head for them and obtained three rams and five ewes. As early as 1800 Governor King wrote: 'The introduction of a breed of Spanish sheep into the flocks of individuals has so much improved the fleeces that there is a promising appearance of a great quantity of wool being produced in a few years.' Meanwhile the government flocks were raised solely to provide food. For wool, Macarthur and Marsden were the chief producers. Macarthur visited England in 1803, and declared before an interested textile audience that Australia would be able to supply all English requirements within 20 years—a prediction which he lived to see fulfilled. In 1807 the first shipment of 245 lb. of merino wool was sent to England, and its fine quality caused a keen demand for the Australian product. Exports increased with each succeeding year, till Australia has become the chief supplier of the world's wool requirements.

Wool-marketing in Australia.—In the early days the practice was to ship wool to London for sale. Local selling began when merchants trading in Australia bought the clips of the smaller sheep-growers to sell in London, using the proceeds there to purchase general merchandise; to advise them they obtained the services of experienced Yorkshiremen. Gradually the demand widened, and speculative buyers of wool came upon the scene. In 1843 Thomas Sutcliffe Mort (q.v.) inaugurated wool auctions on a more or less regular basis, but for many years the trade was of modest proportions. In Victoria Richard Goldsbrough (q.v.) founded the wool selling business in 1848, and so successfully introduced modern methods of showing and selling that Melbourne became the premier wool-selling centre of Australia. In 1880 Melbourne sold 122,272 bales as against 50,000 sold in Sydney; but in the next decade Sydney forged ahead and its sales have since increased and maintained their supremacy. The relative

positions in the several States are shown in the sale returns for the seasons 1924-5 and 1925-6:—

	1924-5. bales.	1925-6. bales.
Sydney	653,200	1,078,216
Victoria	382,743	690,284
Adelaide	165,693	250,216
Western Australia	84,903	124,396
Brisbane	267,641	477,337
Tasmania	33,570	34,885
Totals	1,587,750	2,655,334

Wool-sales progress.—The coming of direct representatives of wool-users from the United Kingdom, from all the wool-using countries of Europe, and subsequently from America and Japan, materially aided the industry and established the policy of local selling. Practically the whole clip is now sold at auction. A small proportion is bought in the country by speculative dealers, but the bulk of this eventually passes through the auctions. The principal selling centres are Sydney, Melbourne, Geelong, Brisbane, and Adelaide; smaller centres are Perth, Albury, Ballarat, Hobart, and Launceston. Efforts to establish others have not been encouraged, and the buying strength is practically divided into two parties. One set attends sales in Sydney and Brisbane; the other works Victoria, Adelaide, Tasmania, and the west. Abnormal conditions produced by the war tended to lengthen the selling season in Australia, but the trend is now towards a season extending from the beginning of September to the end of March, with winter series in Sydney and Brisbane to deal with autumn-shorn wools.

For the accommodation of the clip the wool-selling houses have erected large stores with specially lighted top-floors, upon which the 'shown' bales are displayed. These 'shown' bales are cut open, and buyers spend the morning examining the contents, estimating the yield of clean wool after scouring, and 'valuing' the wool according to their buying limits. In the afternoon they attend the sale rooms and bid for it at auction. Next morning their 'samplers' go to the stores and draw samples from the bulk bales which have not been shown. These are submitted to buyers for examination, and, if they correspond in quality and condition with the 'shown' bales, the sale is completed, the wool paid for, dumped, and countermarked for shipment.

Wool-handling methods.—Wool is sometimes stored for a considerable time before sale. On arrival at the store it is handled by sworn weighers, the weight-slips are recorded and officially filed, and the wool is sold in terms of those weights. In-weights are taken in preference to out-weights, since wool at the seaboard absorbs moisture. The terms of sale are strictly cash before delivery; wool amounting in value to £55,000,000 is sold in a season without any disputes as to payment. The honest packing of the clip by growers inspires the fullest confidence of buyers—a confidence which is fostered by trade regulations governing its handling from the time it reaches the store until it is shipped. Should any false packing or misdescription be discovered in any lot of wool even after it reaches its oversea destination, there is provision for righting the matter; but so uniformly honest are the branding and packing that such claims are of rare occurrence. An enormous amount of work is involved in the preparation and disposal of a catalogue of wool. Such catalogue must give full information of every lot; sample bales have to be taken to the top floor and opened, and a preliminary valuation made. After the sale, the bales must be re-stuffed, sewn up, and returned to the bulk floors, invoices sent to buyers, the money collected, and the wool delivered to the buyer's order. The buyer is allowed a period of 14 days in which to complete his purchase, but the bulk of the wool is paid for well within that time, and is frequently in the ship's hold a few days after sale. Simultaneously the task of rendering account sales to owners for each lot is proceeded with. Wool-selling brokers make liberal advances, if required, as soon as the wool is received into store, recouping themselves when the wool is eventually sold. In recent years the clip in each centre is put up for sale strictly in the order of its arrival into store. This practice ensures absolutely fair treatment for every grower.

Wool-controlling councils.—Experience in war-time showed the advantage of treating Australian wool problems in a federal spirit, and that a system of controlling offerings on a Commonwealth basis would keep prices even and prevent overloading at any point. At that time was formed a body known as the 'Federated Wool-Selling Brokers of Australia,' which rendered good service in helping along the Imperial Purchase Wool Scheme. This body subsequently became the National Council of Wool-Selling Brokers of Australia, which welded together every wool-selling business of importance in the Commonwealth. The council's object is to watch the interests of the wool trade and to confer with the Australian Woolgrowers' Council upon all matters calling for mutual attention. Its principal duty is to frame a selling programme after a full consultation with the latter. The system adopted is to meet as early in the season as is practicable, to draw up for the first half of the season a programme based on the estimated wool production and upon market facilities and prospects, and to determine the quantities to be offered in each centre. Such programme is subject to revision if the two controlling councils agree that it is desirable. Subsequently the second half of the programme is framed upon the experience of the actual sales. Occasionally it is found possible to issue the programme for the full season at the outset. The controlling councils have been signally successful in their work; the most striking evidence of this fact is that in the 1925-6 season a record clip and a carry-over of half a million bales of old clip were, in spite of unfavourable conditions, disposed of without a single hitch. The councils, desiring to provide a system as effective as war-time control, but more elastic and more responsive to the peculiar needs of the industry, have made in each season's programme a distinct improvement.

Wool in war time: the Imperial Purchase Scheme.—The carrying out of the imperial wool purchase scheme, which superseded the auction system at the end of 1916 and covered a period of 3½ seasons, during which wool and sheepskins to the value of £202,578,922 were handled, forms one of the brightest pages in Australian wool history. The first effect of the world war was to paralyse the trade; but later the war itself created a great demand for wool, and steps were taken, more or less effectively, to prevent supplies from reaching the enemy through neutral countries. The submarine campaign created great danger in shipping, difficulties of finance arose,

and sales were hampered by inadequate tonnage. It was at this point that the British government realized that the control of all British-grown wool would not only secure ample stocks for her manufacturers and those of her allies but also prevent leakages to the enemy. Negotiations were therefore opened up by the imperial authorities with the Commonwealth government, resulting in the sale of the balance of the 1916-17 clip to the imperial authorities at 15½d. per lb. (on a 'greasy' basis), plus 50 per cent of any profits on resale. A proclamation under the War Precautions Act prohibited the sale of wool and dry sheepskins, and the trade was called upon at a moment's notice to evolve a new system of appraising the relative value of every lot of wool so as to bring out the whole purchase at 15½d. per lb. A central governing body was constituted, consisting of representatives of every section of the industry—selling-brokers, growers, wool-buyers, manufacturers, wool-scourers, and fellmongers—with a government nominee as chairman. This body, known as the 'Commonwealth of Australia Central Wool Committee' acted under the chairmanship of Sir John Higgins. The detailed working in each State was entrusted to separate 'State Wool Committees,' with representation similar to that on the central committee. A technical advisory board was formed to determine a practical system of appraising wool, and this body created a 'table of limits' which is the most complete classification of wool ever attempted. With gigantic labour it divided the clip of approximately 1,800,000 bales into 848 distinct types, and fixed the price for each in its relation to the purchase price of 15½d. per lb.

The scheme worked admirably, the committees and advisory boards bringing to it their free services and the experience of their lives. So successful was it that it was continued until 19 June 1920. Not only did it effectively control supplies; it guaranteed the solvency of the pastoral industry of Australia, enabling wool-growing to be carried on at a most critical time without hindrance and with the expansion of wool-scouring, manufacturing, and top-making. As the scheme continued and tonnage was restricted, there were great accumulations of appraised wool, necessitating large temporary stores in each State to house it. The central wool committee handled 7,156,616 bales of Australian wool, which, plus charges, were valued at £166,977,382; it also purchased under appraisement 179,763 bales containing 17,398,580 sheepskins, which, plus charges, were valued at £5,948,540. The total value of wool and sheepskins handled, plus charges from warehouse to f.o.b., was therefore £172,925,922. In addition wool-growers and others received the following:—first distribution, 5 per cent on appraised value, paid in cash (October 1920), £7,653,000; second distribution, 14.30951 per cent (approximately one-seventh) on appraised value, paid (30 July 1921), in priority wool certificates, £10,000,000 (30 July 1921) and in fully paid £1 shares in the British-Australian Wool Realization Association Limited, £12,000,000 (30 July 1921). Thus the grand total was £202,578,922.

War-time wool accumulations—British-Australian Wool Realization Association.—The imperial wool purchase scheme ended on 30 June 1920, when wool again became 'free' and the trade automatically reverted to the auction-selling system. On the termination of the scheme there was a considerable sum of undistributed proceeds, and a large carry-over of wool which had been paid for at appraised prices had still to be disposed of. In December 1920 there were 1,836,000 bales on hand, and the British-Australian Wool Realization Association Limited (commonly known as 'Bawra') was formed. Bawra took over the work of clearing up, and in May 1924 the last bale was shipped. In May 1926 the association went into voluntary liquidation. The amounts distributed were:—

5 per cent dividend	7,686,283	3	5
Priority wool certificates and capital reductions	21,407,602	19	0
Total	£29,093,886	2	5

The amounts to be distributed at the date of liquidation were:—

Capital account at 1s. per share	592,402	1	0
Surplus, 31 December 1925	5,446,034	10	3
Total	£6,038,436	11	3

Amounts held in trust were:—

Skin wool trust (pending settlement of liquidation)	1,583,189	16	7
Wool-selling brokers' trust	317,666	9	8
Total	£1,900,856	6	3

Wool record prices.—The highest price ever obtained for Australian wool—16s. 4d. per lb.—was secured by John Macarthur in 1827 for a single bale lot; earlier sales of his had reached 10s. 6d. per lb. For modern times the record price for greasy merino is 9s. 1d., secured in London in February 1920 for a line of 'NC' wool from Geelong, Victoria. The highest price secured in Australia during recent years is 4s. 5½d., given for a lot of 'Plains' wool at Geelong. The records for Australian wool from 1910 to 1925 have been:—

Season.	Greasy merino fleece.	Greasy crossbred fleece.	Scoured merino fleece.	Scoured crossbred fleece.
	d.	d.	d.	d.
1910-11	18¼	15¼	24½	20
1911-12	18½	14¾	24¾	17¾
1912-13	19¼	15¾	26½	20½
1913-14	20½	15	28	20¾
1914-15	18¾	18	28	22¼
1915-16	24¾	23½	44¼	27
1916-17	33½	29	46½	39
1917-18	31¾	28	48	40¾
1918-19	31¾	28	48	40
1919-20	31¼	29½	49	40
1920-21	49½	30½	64	31
1921-22	42½	25½	51	29½
1922-23	40½	34¾	57¾	37¼
1923-24	46½	39¾	64	52
1924-25	53½	43½	70½	45
1925-26	42½	28	48¼	31

Wools of Australia and their characteristics.—A great variety of wool is grown in *New South Wales*, but about 87 per cent of that sold is merino, the remaining 13 per cent including crossbred and all other coarse kinds. Nearly every type of merino is grown, each district presenting distinct characteristics. The New England tablelands produce some of the softest and finest medium combing wools, distinguished by a bluish tinge and a marked degree of brightness. Riverina wools are generally of splendid growth and quality; the eastern half of the district produces good length and high quality and the western half a bolder and more robust combing type with a deep-grown sound staple. In the south a bold shafty combing type is produced. Mudgee wool is famous for its softness and fineness, and the Young, Yass, and Boorowa districts produce one of the best combing wools marketed, of a soft silky texture and good yielding. Monaro wools are as a rule yolky and discoloured. That from the Liverpool plains, of medium to fine quality and fair combing length, is generally sound but burry. Dubbo

and Coonamble wools carry burr, and have medium length and quality with a wasty tip. From the Bourke, Cobar, and Nyngan districts come the 'red' wools, sometimes of poor yielding, but with a reputation for fineness and delicacy of fibre. Walgett-Collarenebri wools are of medium length and light condition, and scour up well. The Moree-Narrabri district grows a bold combing type, medium to strong in quality.

Victoria produces more crossbred wool than the other States, but is still the home of some of the finest-woolled merinos in the Commonwealth. These are centred in the western district, and the wool is mostly sold in Geelong. This district has produced wool incomparably superior to any grown elsewhere in Australia; it is regarded as faultless, and is always in special demand. Western Wimmera wools are second only to those of this district. The Victorian industry in general has lost considerably through closer settlement schemes; the individual flocks are smaller than those of New South Wales and Queensland, and crossbred wool predominates. About 58 per cent of the wool sold in Melbourne is merino; this includes a good proportion of wool grown in the Riverina district of New South Wales, which comes to Melbourne as the nearest selling centre.

Queensland's huge areas of sheep-country are well adapted for the production of merino wool; in 1925-6 the production was 99 per cent merino and 1 per cent crossbred and other coarse kinds. The great western plains are the home of large fine-quality merino flocks, many exceeding 100,000 head. The Longreach, Muttaburra, and Richmond districts have more than a million sheep each, and Cunnamulla, Winton, Blackall, and St. George nearly a million. Crossbreds are confined to coastal areas and the Darling Downs. Queensland merinos are uniformly fine in fibre, but the pastures are subject to such extremes of climate that when the season is good the wool is inclined to boldness, whereas in droughty years it has a 'hunger fineness.' In very dry years it shows 'canary' stain—a light yellow shade—caused by the great heat from the ground. The extreme climate has a tendency to rob the wool of its character, but this is checked by the introduction of fresh blood from southern flocks. The feature of Queensland wool which appeals to buyers is its comparative freedom from burr and other vegetable matter. With normal weather conditions the growers market a clip of fine quality, dry, and very free of seed and burr, though sometimes dusty.

South Australia in 1925-6 produced 96 per cent merino and 4 per cent crossbred and British breeds. The South Australian merino is distinctive; it is a bold, robust type, broad-fibred in staple, deeply grown, and well suited to the Yorkshire trade. *Western Australia* produced 96 per cent merino, showing a great improvement in quality in recent years. Care in breeding types suited to the various districts has led to better results and a keener response from buyers. The clip is sound, well-grown, and high-yielding, but the wool in some districts shows discoloration, a characteristic of subtropical areas; much of it is freighted with red dust. The farming districts produce well-grown sound wools of good quality.

Tasmania was once the chief source of fresh blood for merino flocks, and high prices were paid for rams and ewes of the noted Tasmanian strains. Tasmanian sheep gave excellent results, formed the foundation of many successful mainland flocks, and are still in fair demand. Only a moderate amount of merino wool (about 24 per cent) is shorn, but the quality is high and the wool has a bright attractive appearance, being usually free from vegetable matter. Seventy-six per cent of the wool produced in 1925-6 was crossbred.

Wool-scouring.—Most of the wool offered at the Australian auctions is 'greasy,' i.e. unwashed. In the early days the practice was to wash the wool on the sheep's back before shearing, but the difficulty in keeping the sheep clean after washing was great, and the practice was abandoned; 'washed' wool is now practically unknown. Scouring wool before sale has also fallen off, because buyers prefer wool in the grease. Of the wool sold in the Commonwealth in 1924-5 96 per cent was in the grease and 4 per cent scoured. At present only the lower grades are scoured, but previously many of the larger stations had their own scouring plants and there were many country scouring establishments which treated local wools. Under the appraisement scheme an impetus was given to the scouring industry by the shortage of tonnage and the desire to economize space, but when the scheme ended the industry languished. Many big works in the capital cities which formerly treated large quantities now confine their operations to fellmongered wool, treating only the lower qualities of the clip—locks and dead wool. In New South Wales about 5 per cent, in Victoria, South Australia, and Western Australia about 1 per cent, and in Queensland 10 per cent is scoured. Conditions differ in Queensland, the wool having longer distances to travel and the cost of carriage being less if the grease and dirt are removed. Moreover there is an abundance of naturally heated bore-water, and Queensland wools scour well, being free from burr and vegetable matter. There are at Longreach and other centres large scouring works where many big clips are treated.

Fellmongering is a more stable industry, and though a large number of sheepskins are dried and shipped—principally to Mazamet in France—fellmongers do a steady business in reclaiming the wool from skins and selling it in the scoured state. Some comes to auction, but the bulk of it is sold privately for export. In New South Wales and Victoria the industry is well established. The 'green' skins supplied by the abattoirs and the butchering or freezing establishments are 'sweated,' and the wool is removed from the pelt. The wool, after scouring, lacks 'life' and elasticity, but it is useful and has a steady sale. In 1924-5 there were 94 fellmongering and wool-scouring works in the Commonwealth, 40 being in New South Wales, 29 in Victoria, 18 in Queensland, 3 in South Australia, and 4 in Western Australia.

Woollen manufacture in Australia began in 1801, when a few rough blankets were made up by the convicts, but this work ceased next year owing to the shortage of wool (see MANUFACTURES). King offered 2d. per lb. for wool, but met with no response. The industry was further hampered by the lack of skilled overseers. In September 1803 George Mealmaker entered into a contract with the government for four years as master-weaver, and in August 1804 an enclosure was built round the Parramatta jail large enough to include every branch of wool manufacture. The first factory (supervised by Samuel Marsden) was a room, 60 x 20 feet, with store-rooms at the end; in 1821 a two-storied stone building replaced it. In 1805 numbers of settlers set up hand-looms and made a crude but durable cloth which sold at 2s. 6d. a yard of four quarters wide; it was chiefly used for 'working clothes.' During that year

2201 yards of blanketing were made, 58 female convicts being employed in the work. From 1807 until 1812 wool manufacture was neglected, and Macquarie, finding the female convicts 'burthensome in point of Expence,' suggested the reopening of the factory at Parramatta for making slop-clothing locally. The building had been partially destroyed by fire, and he asked that a plan of a new factory, providing accommodation for 100 women, should be sent out immediately, together with the necessary implements and machinery for dyeing and milling. In 1814 John Hutchinson made and erected various machines for the improvement of wool manufacture, and in 1819 Macquarie claimed that Australian wool would manufacture as well as Spanish. One of the earliest private mills was established in 1832 at Blackwattle Bay on the outskirts of Sydney, where 'the finest as well as the coarsest cloths' were manufactured. By 1860 there were five mills using handlooms, and in 1867 Geelong, aided by a protective policy, became firmly established as a manufacturing centre; it soon became the biggest wool-using centre in Australia. Victorian mills, encouraged by protection, gained upon the mills of other States (especially New South Wales, which had to face the dumping made possible by free trade). Queensland had one mill, which survived after years of struggle. In Tasmania three mills survived a critical period.

In New South Wales the pioneer mills—Vicars's Marrickville mills, the Cooerwull woollen mills at Bowenfels, the Parramatta woollen mills, the Granville mills, and a few others—weathered the freetrade era through the edict of Sir George Reid (q.v.) that all blankets and woollens for uniforms required by the State government should be made locally. Federation benefited the local manufacturer, especially in those States which had lacked protection from old world competition. A great impetus was given by the war of 1914-18, most of the mills being fully occupied in supplying clothing material for the expeditionary force; by the time that this demand ceased, local cloth for civilian purposes was more in request. Subsequently there was a period of dullness, as in 1924-5 Australian mills were greatly hampered by the dumping of cheaply produced goods, but the new federal tariff of September 1925 saved the industry. Employment is increasing, plants have been expanded, and new companies established; competition has lowered prices, and a reputation for quality has been gained by the local product. The quantity of wool used locally is estimated by the government statistician at 50,000,000 lb. per annum. The number of woollen and tweed mills increased from 29 in 1919-20 to 49 in 1924-5, and the value of the output from £3,290,511 to £5,071,124. In 1925 Victoria had 28 mills, New South Wales 12, Tasmania 5, and Queensland and South Australia 2 each. The production is chiefly that of tweed cloths, flannels, rugs, and blankets, all of which have acquired a name for purity and durability. In addition to the woollen and tweed factories there were 252 hosiery and knitting mills operating in 1924-5.

Wool Tops (the name given to wool after it has undergone the process of scouring and combing).—Top-making began in 1910, when the Commonwealth government offered a bounty of 1d. per lb. on all tops exported; in 1914, when the industry was well established, this was withdrawn. Japan bought extensively from the first, and during the war increased her buying, since she was cut off from supplies of Bradford tops; an impetus was thereby given to the industry, existing plants were increased, and new ones erected. Lately the industry has slackened, but Japan is still a consistent buyer, and occasional shipments are made to Great Britain, the United States, and Canada.

Wool statistics—Production.—The production of wool in Australia during 1925-6 was 744,654,931 lb., of which New South Wales produced 380,607,500; Queensland, 141,212,000; Victoria, 105,525,630; South Australia, 61,932,000; Western Australia, 44,613,801; and Tasmania, 10,764,000. The total sales in the Commonwealth for 1925-6 reached the record figure of 2,655,334 bales, as against 1,587,750 in 1924-5. The Sydney total exceeded a million bales.

Classification of clip.—Sydney: merino 87 per cent, crossbred and other coarse wools 13 per cent; Melbourne and Geelong: merino 58, crossbred 42; South Australia: merino 96, crossbred 4; Western Australia: merino 96, crossbred 4; Queensland: merino 99, crossbred 1; Tasmania: merino 24, crossbred 76. The percentage for the Commonwealth is:—merino 82, crossbred and other coarse wools 18 per cent.

Condition of wool sold in the Commonwealth.—Sydney: greasy 95 per cent, scoured 5 per cent; Melbourne and Geelong: greasy 99, scoured 1; South Australia: greasy 99, scoured 1; Western Australia: greasy 98, scoured 2; Queensland: greasy 94, scoured 6; Tasmania: greasy 100. Total for the Commonwealth: greasy 97, scoured 3 per cent.

See Cox, William; Macarthur, John; McCaughey, Sir Samuel; Marsden, Samuel; Manufactures; Pastoral Industry; Shearing; and Sheep.

THE TOTAL VALUE IN POUNDS STERLING OF WOOL EXPORTED FROM AUSTRALIA TO VARIOUS COUNTRIES FOR THE FIVE YEARS 1921-6.

Country to which exported.	1921–2.	1922–3.	1923–4.	1924–5.	1925–6.
United Kingdom ...	23,013,128	25,901,608	20,136,750	£4,386,464	23,195,387
France	6,842,265	10,408,195	12,278,938	12,484,097	15,821,883
Japan	4,438,672	6,095,616	6,212,881	7,479,586	5,863,604
United States of America	4,347,360	5,618,652	4,323,239	5,926,430	6,073,384
Belgium	3,784,065	2,514,717	4,951,127	3,844,335	4,221,649
Italy	2,667,081	2,498,733	2,634,990	3,327,166	2,522,541
Germany	2,404,833	3,448,031	3,576,436	4,929,589	5,034,503
Netherlands ...	44,388	347,698	1,625,493	367,651	117,408
Canada	245,421	184,365	154,323	162,395	121,359
India	50,243	11,487	123,550	108,522	14,897
Other Countries ...	139,787	109,662	179,431	242,320	213,175
Total ...	47,977,243	57,138,764	56,197,158	63,258,555	63,199,790

THE VALUE IN POUNDS STERLING OF SALES IN THE SEVERAL STATES FOR THE FIVE-YEAR PERIOD 1921-6.

State.	1921–2.	1922–3.	1923–4.	1924–5.	1925–6.
New South Wales ...	15,201,115	19,159,188	21,710,769	22,826,809	23,744,076
Queensland ...	7,774,345	8,707,990	9,697,752	9,994,912	11,243,954
Victoria	9,407,154	11,619,270	12,830,962	13,655,409	14,764,443
South Australia ...	3,391,025	3,998,983	4,949,620	5,123,896	4,566,165
Western Australia ...	1,115,342	2,023,443	3,244,713	2,723,667	2,663,745
Tasmania	407,742	729,927	871,558	1,221,145	735,632
Commonwealth ...	37,296,723	46,238,801	53,305,374	55,545,838	57,718,015

AVERAGE VALUE PER BALE SOLD IN AUSTRALIAN CENTRES IN THE SAME FIVE YEARS.

State.	1921–2.	1922–3.	1923–4.	1924–5.	1925–6.
New South Wales ...	16 10 2	23 7 10	31 4 3	34 18 11	22 0 5
Queensland ...	20 17 11	28 7 5	35 0 5	37 6 11	23 11 1
Victoria	15 9 5	22 9 9	30 14 3	35 13 7	21 7 9
South Australia ...	14 16 5	22 10 3	27 17 4	30 18 5	18 5 0
Western Australia ...	15 18 1	24 11 9	31 11 6	32 1 7	21 8 9
Tasmania	15 3 1	24 10 10	31 13 5	37 6 6	21 1 9

R.J.M.W.

Woolley, JOHN (1816-1866), son of a surgeon practising at Petersfield in Hampshire, was born on 28 February 1816, and educated at Brompton and at the universities of London and Oxford (B.A., 1836; M.A., 1839; D.C.L., 1844). While an undergraduate he was a scholar of Exeter College, and after taking his degree won a scholarship at University College and a fellowship at his own college. Taking holy orders in 1840, he was appointed headmaster of the Edward VI grammar school at Hereford in 1842, of Rossall in 1844, and of Norwich in 1849. Meanwhile he had been made head of the university of Corfu, but resigned because the Greek priests objected to the rule of an English priest (they did not object to a layman, and the appointment passed to Sir George Bowen, q.v.). In 1852 he was chosen first professor of classics —and *ex officio* principal—of 'the University College of Sydney,' which was almost immediately merged in the university itself. He took a prominent position not only in the educational but in the social world of Sydney; he was one of the original trustees of the Sydney Grammar School, and the first to propose that linking-up of primary schools with the university which has developed into the present elaborate high-school and public examination system (see EDUCATION, PUBLIC); and by public lectures, conducting classes preparatory to matriculation, and any other means that might be devised from time to time, he appealed to the intellectual instinct in the population at large. His work, wrote H. E. Barff, 'aided very materially in the moulding and forming of our present University, as well as in the direction of men's minds throughout the colony to a knowledge and love of true culture and an enlightened morality.' Visiting England in 1865, he was drowned on 11 January 1866 when the s.s. *London* foundered in the Bay of Biscay.

Woolls, WILLIAM (1814-1893), the 19th child of a merchant of Winchester in England, was born in March 1814, educated privately, and thrown on his own resources at the age of 16. In 1831 he left England for New South Wales, and in the following year was given a mastership at the newly founded King's School at Parramatta, passing to the Sydney College four years later, and afterwards keeping a school of his own at Parramatta and other places. Making the acquaintance of Baron von Mueller (q.v.), he took up the study of botany, and supplied the baron with collections of plants and with field-notes. In 1867 he published *A Contribution to the Flora of Australia,* which, with other botanical memoirs on introduced plants and the plants of Parramatta, gained him the fellowship of the Linnean Society and the Ph.D. of Gottingen. While he was still a schoolmaster Samuel Marsden made several attempts to induce him to take holy orders; but he was always modest and unobtrusive, and only in 1873, when Bishop Barker ordained him, was he persuaded to accept the responsibilities of a parish priest. He was appointed to Richmond, and later on became rural dean of that area. He lectured and wrote on many subjects (including a short biography of Samuel Marsden), but will be remembered for his botanical work, which is permanently commemorated in the genus *Woollsia* and in many species named after him by admiring followers. He retired from active work in 1892, and died on 14 March 1893.

Worms. The term 'worm,' as used in popular language, is of very loose and vague connotation, and is applied to a great range of animal forms having little relationship with one another. Thus we call the larvae of certain insects 'meal-worms,' 'glow-worms,' 'silk-worms;' we call a mollusc 'ship-worm,' and a lizard 'blind-worm.' Even in zoological literature the group 'Vermes' still survives in some classifications—a very heterogeneous one, used as a convenient receptacle for a number of classes of animals of lowly organization whose relationships to any of the chief phyla of the animal kingdom are uncertain. In the present work articles on various types of worm will be found under BRISTLE-WORMS, EARTHWORMS, FLAT-WORMS, LAND PLANARIANS, LIVER-FLUKES, NEMATHELMINTHES, NEMERTINEA, and TAPEWORMS. W.A.H.

Wragge, CLEMENT LINDLEY (1852-1922), born at Stourbridge in Worcestershire on 18

September 1852, was trained for the law, which he abandoned to study navigation. After some experience of sea-life he migrated in 1876 to South Australia and was appointed to the surveyor-general's department. Returning to England in 1878, he devoted himself to meteorology, took charge of three stations in Staffordshire, and in 1881 founded the observatory on Ben Nevis in Scotland. In 1883 he came back to South Australia, founded the Torrens observatory at Adelaide (1 January 1884) and a second at Mount Lofty (10 October 1884), and in 1887 was appointed government meteorologist of Queensland. In 1895 he reorganized the meteorological service of Tasmania (where he founded the Mount Wellington observatory), and in 1897 established a high-level observatory on Mount Kosciusko—the highest point in Australia—with a corresponding low-level station at Merimbula. In 1902 he resigned the Queensland post to enter on a period of research in the South Sea islands, but in 1910 settled at Auckland in New Zealand, where he established a weather bureau, scientific museum, and botanical gardens. There he died on 10 December 1922.

Wrasses, fish of the family Labridae, commonly called 'parrot-fishes' on account of their brilliant coloration, but differing from the true parrot-fish of the family Scaridae in having ordinary teeth in the jaws instead of a powerful beak. Great numbers of wrasses are found on the Australian coasts, nearly all remarkable for their gorgeous colours and intricate patterns of every tint. The tropics—especially the great expanse of coral-reefs on the Queensland coast—are the home of some wonderfully ornamented species of the genera *Thalassoma* and *Halichoeres*; the temperate waters are inhabited by various species of *Pseudolabrus*. They exhibit marked bisexual coloration, the adult males of many species being readily distinguished from the females either by different colours or by distinctive markings. They are essentially rock-dwellers, and as food-fishes are held in varied esteem on account of their distinctive flavour—by some they are highly appreciated and by others despised. Their flesh is white but soft and usually deteriorates rapidly after death.

The Rainbow-fish or Maori (*Ophthalmolepis lineolatus*), not to be confused with another fish also called rainbow-fish (see PARROT-FISHES), is a southern species commonly captured with lines in deep water off rocky reefs, and is a useful table-fish. It is scarlet with longitudinal stripes of blue and white; the head and fins are ornamented with blue streaks that recall the tattooing on the faces of ancient Maoris. The southern gropers (*Achoerodus*), not to be confused with the northern fish of the same name (for which see ROCK COD), attain a length of four feet, and are sometimes well represented in the markets, though they are usually taken by line-fishermen. The male, called 'blue groper,' is distinguished by its bluish tint from the reddish-brown female or 'red groper.' The Pigfish (*Verreo oxycephalus*) is a rich pink, with black blotches on the dorsal fin: it feeds on crabs and fish in the neighbourhood of rocky reefs in cool waters, and is a much finer food-fish than most of its allies. The tusk-fishes (*Choerodon*), a group of tropical species, attain a large size and are regarded as choice table-fish; they are very brilliantly coloured, and derive their vernacular name from the presence of a strong tusk that projects from the angle of the mouth on each side.

A.R.McC.

Wrecks and Shipping Disasters.

SECTION I

MARINE CASUALTIES

1622-1825

ACTEON, ship, was wrecked off Acteon Island, near Recherche Bay, southern Tasmania, 28 October 1822.

ACTIVE, brig, landed 10 people on an island off New Zealand, February 1809, and was not heard of again.

ADMIRAL BARRINGTON, transport from Sydney to Bombay in 1792, arrived in sight of shipping at Bombay, but was driven off shore in a gale and wrecked on Malwan Island, where all the crew were murdered by the natives, except the master, mate, and surgeon, who swam to a vessel lying at anchor.

ADVENTURE (336), one of Cook's ships on his second voyage to the Pacific, 1772-74, was lost, 24 May 1811, in the Gulf of St. Lawrence.

ALEXANDER (452), First Fleet transport. See *Friendship*.

ALMORAH, ship, was seized by H.M.S. *Slaney* in 1825 and sent as a prize to Calcutta, on the ground that she was infringing rights of the East India Company by trading to Australia.

AMSTERDAM and WESEL, two small Dutch yachts, on voyage from Banda towards the Gulf of Carpentaria landed on the western coast of New Guinea, where Gerrit Pool, the master, and three of his crew were killed by natives in 1636.

ARGO, small schooner or brig, left Port Jackson for China, 7 October 1798, and was there sold to Robert Berry. On her way back she was wrecked, January 1800, on Argo Reef, south-eastern Fiji. Her crew reached Tongatabu, where most were killed by natives, two survivors were rescued one or two years later.

ARNHEM or AERNEM, Dutch yacht from Amboina, left with the *Pera* for Cape York Peninsula in January 1623. On 11 February ten of her crew were killed and seven wounded by natives of New Guinea. She reached Banda again on 14 May.

ASTROLABE, French exploring ship under La Pérouse, left Botany Bay, 10 March 1788, and was wrecked on Vanikoro Island, Santa Cruz group, all hands being lost then or a little later.

BATAVIA, Dutch ship, was wrecked on Wreck Point, Pelsart Island, Abrolhos Rocks, W.A., June 1629, with about 220 people. See AUSTRALIA, DISCOVERY OF.

BETSEY, sealing vessel, chartered by J. Underwood, left Sydney for Macquarie Island (South Pacific) in December 1814. In August 1815 she was blown off shore; the crew suffered terrible privations, and in October abandoned her off New Zealand. Only 8 landed near North Cape, 11 having succumbed to hardships.

BLACK JOKE, schooner, was wrecked at Port Macquarie, December 1823.

BOUNTY (215), H.M.S., under Captain Bligh (q.v.). After leaving Tahiti the crew mutinied, April 1789. See BOUNTY, MUTINY OF THE. Eventually the mutineers took her to Pitcairn Island, where she was beached and burnt.

BOUSSOLE, wrecked with *Astrolabe* (q.v.).

BOYD, ship, was seized in 1809 at Whangaroa by Maoris, who massacred about 60 people, only 4 being spared. These were rescued by Alexander Berry with 3 armed boats. The ship was burnt by natives.

BOYD, colonial schooner, was wrecked, 16 July 1812, between Port Hunter and Port Stephens. She was originally the longboat of ship *Boyd*.

BRAMPTON (or BROMPTON), ship, from Whangaroa for Sydney, with Revs. Marsden and Leigh aboard, was wrecked on a small island while beating out of the Bay of Islands, New Zealand, a dozen miles from her anchorage, September 1823. Her people landed on the islet and suffered hardships during an easterly gale for 3 days, until rescued by natives from Whangaroa.

BRIDGEWATER (750), transport, left Sydney in company with *Porpoise* and *Cato*. When these two (with Flinders aboard) were wrecked on Wreck Reef, August 1803, she abandoned them, reached India safely, left for London, and was never heard of again.

BRITANNIA, ship, Nathaniel Goodspeed master, was wrecked, probably on Middleton or Elizabeth Reefs, in Tasman Sea, 25 August 1806. Two boats reached Sydney; one boat was lost, and probably 8 lives.

BROTHERS (40), sloop, owned by G. Blaxcell, was wrecked in 1816 on the way from Port Dalrymple to Sydney.

BUIJS, Dutch brigantine, left Banda, 1 April 1756, for Cape York Peninsula. On 30 April she lost a boat with a crew of 8 men in the Gulf of Carpentaria. She returned to Timor Laut, 20 May 1756.

CAMPBELL MACQUARIE (245), sealer, was wrecked on Macquarie Island, South Pacific, 10 June 1812, with 5 lives lost.

CAMPBELL MACQUARIE, brig, Underwood owner, sailed from Sydney to Fiji for sandalwood. While lying at Koro Island, she sent a boat on 25 September 1815 to Wailea Bay, where four of the crew were killed by natives.

CASUARINA (45), colonial schooner, was sold in 1802 by Governor King to Commodore Baudin, to assist the French in exploring the western coast of Australia; she was finally dismantled at Mauritius, August 1803.

CATO (450), transport ship, was lost with *Porpoise* on Wreck Reef, 140 miles outside Great Barrier Reef, 17 August 1803, while returning to England. 3 lives were lost. Flinders sailed to Sydney in a boat and returned with *Rolla, Francis,* and *Cumberland* for the survivors.

CHESTERFIELD, ship, sailed in company with *Shah Hormuzeer* through Torres Strait in 1793. Her boat was sent to Darnley Island, where 5 of the crew were killed by natives.

CITY OF EDINBURGH (526), ship, owned by Alexander Berry, in 1809 rescued survivors of the *Boyd* tragedy, New Zealand. She left New Zealand with timber for the Cape of Good Hope in January 1810, but in stormy weather near Straits of Magellan drifted up to Valparaiso, where she was refitted, then sailed for Cadiz, but was finally abandoned in a sinking condition off the Azores.

CONTEST, colonial schooner, was wrecked at Port Stephens, 28 February 1807.

CUMBERLAND, a large boat, while on way to the Hawkesbury River from Sydney was seized by convicts, who put the crew ashore, 5 September 1797, and sailed away. In March 1798 some of them were recaptured, but not the boat.

CUMBERLAND (26), colonial schooner, in which Flinders made voyage from Wreck Reef to Mauritius, where she was seized by the French and he detained as a prisoner from December 1803 to July 1810, eventually rotted to pieces there.

CUMBERLAND (80), colonial schooner, sailed from Sydney to Tahiti for sandalwood. On 12 August 1814, when at Raratonga, 5 of her crew were killed and eaten by natives. The schooner reached Sydney safely with survivors.

CYGNET, buccaneer ship under Captain Read, with William Dampier (q.v.) aboard, visited north-western Australia in 1688. On account of being rotten she was abandoned by her crew and sank in St. Augustine's Bay, Madagascar, in 1690.

DIANA, was stranded in Diana Bay, east coast of Flinders Island, Bass Strait, in 1801; she was refloated in 1802 and renamed *Surprise*.

DROMEDARY, H.M.S., took fire in Sydney Harbour, 7 March 1810, and was nearly destroyed. Great credit was due to Captain Pasco of H.M.S. *Hindostan* in extinguishing the fire. These two ships had brought out Governor Macquarie and took home Governor Bligh. (See *Historical Records of New South Wales*, vol. 7, page 309.)

DUFF, first mission ship to the Pacific, during 1796-7-8 made a successful voyage among the South Sea islands for the London Missionary Society. On her second voyage towards the Pacific she was captured by French privateer *Buonaparte* off Cape Frio, near Rio de Janeiro, 19 February 1799. Her 30 missionaries lost everything, and returned to England after many difficulties and privations.

DUKE OF PORTLAND (or PORTLAND wrongly so called) (400), American ship. In June 1802 the crew were massacred at Tongatabu, only one woman, Elizabeth Morey, being spared, at the instigation of a white scoundrel named Doyle.

DUNDEE, ship, was lost at Newcastle, 15 August 1808; she sailed from Penang to Sydney, then for Fiji for sandalwood, but was wrecked at the entrance to Hunter River.

DUYFKEN (30 or 60), Dutch yacht, Captain Willem Jansz, left Bantam, 8 November 1605, for New Guinea and sailed down to Cape York Peninsula, her crew being the first white men to see Australia. She lost some of her men killed by natives; so returned and reached Banda, June 1606.

EDWIN (16), sloop, owned by Commissary Palmer, was lost about 1812.

ELISA or ELIZA, American brig, was wrecked off Nairai, Fiji group, May 1808. A number of runaway convicts were aboard; they and the crew made friends with natives of Mbau and fought for them, so that they became the most powerful natives in the group. Officers and two sailors escaped in the whaleboat.

ELIZA (10), decked longboat rigged as a schooner, went in July 1797 with the *Francis* for the survivors of the *Sydney Cove* (q.v.). She was lost with all hands (about 12) while returning.

ELIZA, colonial schooner, owned by J. Underwood, was lost, 14 July 1811.

EL PLUMIER. See *Ploomer*.

EMU, H.M. armed brig, made several voyages between Sydney and Hobart during 1815. She left Sydney for London in March 1816, ran ashore near Cape of Good Hope, was sold, repaired, and finally lost near Simons Bay in 1817, only one man being saved.

ENDEAVOUR (368), ship, Captain James Cook, stranded on Endeavour Reef, five miles east of Hope Islands off Cape Tribulation, Queensland, 11 June 1770. She was refloated next day and repaired in Endeavour River and continued her voyage on 11 August.

ENDEAVOUR, East Indiaman ship from India, Captain Bampton, left Sydney for Bombay via New Zealand in September 1795. She sprang a leak and was beached in Dusky Bay. A number left in the small schooner *Providence* (which was built there) and reached Norfolk Island. Others reached Sydney in the longboat, which they refitted and named *Assistance*. No lives were lost. Her remains are still visible in Dusky Bay. This vessel is sometimes wrongly stated to be Captain Cook's old ship.

ENDEAVOUR (31), colonial schooner, owned by Kable, was lost at Shoalhaven in March 1813.

ENDEAVOUR, coaster schooner, John Black owner, wrecked off Nobby's, Newcastle, December 1817.

ENDEAVOUR, schooner, was lost off Broken Bay, 12 June 1825.

ESPERANCE and RECHERCHE, of French expedition under D'Entrecasteaux searching for La Pérouse, left Tasmania, February 1793, arrived Surabaya in Java in October 1793, where eventually they were seized by the Dutch in payment for disbursements and were dismantled. Survivors drifted back to France as best they could.

ESSEX, United States frigate, 32 guns, Captain David Porter, was sent into the Pacific Ocean to raid British shipping in 1813-14. See *Greenwich* and *Seringapatam*. After capturing a number of whalers the *Essex* was destroyed off Valparaiso by H.M. frigate *Phoebe*, 28 March 1814.

ESSEX, American South Sea whaler, is said to have been struck by a whale and sunk when near Pitcairn Island, 20 November 1820. Part of the crew in 2 boats arrived on the coast of Chile. Another boat is supposed to have been wrecked on Ducie Island, where 4 skeletons were found. Terrible hardships occurred, with cannibalism and deaths.

ESTRAMINA, Spanish prize, armed schooner, captured by brig *Harrington* of Sydney and taken to Jervis Bay in 1805, was appropriated by Governor King and lost in 1817 when leaving Hunter River with cargo of coal.

FALCON, U.S.A. whaler, was wrecked on Rurutu Island, south of Tahiti, about 1822. No lives were lost.

FAME, ship, was wrecked in Torres Straits about 1817.

FLY (13), sloop, owned by Commissary Palmer, was lost about 1810.

FRANCIS (41), H.M. colonial schooner, the first vessel launched in Australia, the frame having been sent from England, was wrecked on Oyster Bank during the night of March 20-21, 1805—the first vessel to be wrecked in that notorious graveyard. She was blown ashore high and dry at low water, but was so smashed about by breakers that she was a wreck. No lives were lost.

FREDERICK, from Sydney in 1819, was wrecked in Flinders group near the western head of Bathurst Bay. She was found by Captain P. P. King. 22 of her crew were lost and 3 were saved.

FRIENDSHIP (274), convict transport in First Fleet, left Sydney for England in July 1788 with ship *Alexander* under Lieutenant Shortland. So many of their crews died that all survivors were taken aboard *Alexander*, and the *Friendship* was sunk off Borneo, 28 October 1788. *Alexander* was refitted and remanned at Batavia.

FOX, brig, took fire at Campbell's Wharf, Sydney, 20 July 1808. Much damaged, she sank, but was refloated later.

GEORGE (28), colonial sloop, owned by Commissary John Palmer, stranded at Twofold Bay when loaded with sealskins, about 1806. The crew were attacked by natives, but drove them off. She was lost a few years later.

GOLDEN DRAGON. See *Vergulde Draeck*.

GOOD HOPE or GOEDE HOOP. See *Vergulde Draeck*.

GOVERNOR KING (75), colonial schooner, was lost, 22 April 1806, on Oyster Bank, Newcastle, close to the wreck of the *Francis*.

GREENWICH, ship, was captured by United States raiding frigate *Essex*, who sent her to the Marquesas, where several of the Americans were killed by natives, 16 May 1814. In consequence the Americans set fire to the *Greenwich* and sailed away in another prize,

the *Sir Henry Hammond*. See also *Seringapatam*. These ships were South Sea whalers.

GUARDIAN, H.M. old forty-four-gun ship, Captain Riou, when bound from London to Sydney with stores in 1790, struck an iceberg at night, twelve days after leaving Cape Town. 4 boats left with 200 men, but only one boat survived. Riou with 25 men remained aboard and with extreme difficulty saved the ship, taking her in after 9 weeks' struggle to Cape Town, where she was condemned.

HARRINGTON or HARINGTON (180), brig, of Sydney, was piratically seized, 15 May 1808, by a gang of 50 convicts, who sent the crew ashore in boats next day. They fought with H.M.S. *Dedaigneuse* off the coast of Luzon and ran the ship ashore, where some of them escaped and 20 were captured.

HEBE, ship, was wrecked on Hebe Reef at the entrance to Port Dalrymple, Tasmania, 15 June 1808.

HENRY, was lost in Torres Strait, April 1825.

HIBERNIA, sandalwood and trading brig, Captain W. Campbell, took missionaries from Tahiti, October 1809; sailed for Fiji and struck a reef off Mathuata Island, where she was repaired, 20 November to 9 January 1810, during which time these missionaries lived ashore. They then re-embarked and were landed in Sydney, 17 February 1810.

HUNTER, sandalwood trader from Calcutta, in March 1814 attacked the natives of Mbau Island, Fiji, and lost 14 of her crew, who were killed and eaten. P. Dillon, who later found relics of La Pérouse, was mate of *Hunter*.

INDEPENDENCE, South Sea sealer, was wrecked on Antipodes Island about 1806.

INTEGRITY (59), colonial cutter, on 20 June 1805 sailed from Sydney to Valparaiso with dispatches, under command of Lieutenant C. Robbins, and was never heard of again.

INVESTIGATOR (formerly XENEPHON), was H.M. surveying ship, Captain Matthew Flinders, 1801 to 1803; then, being rotten, she was converted into a hulk. In 1805 she was patched up and navigated to Liverpool by Captain Kent, but was broken up in 1810.

INVESTIGATOR, cutter of, was swamped off Cape Catastrophe, near Memory Cove, Spencer Gulf, 1802. 7 men were drowned.

ISABELLA, ship, from Sydney to London, was wrecked on a reef off the Falkland Islands on 7 February 1813. All her people were landed on Eagle Island, rescued 3 months later by H.M.S. *Nancy*, and taken to Rio de Janeiro. Among the passengers were Sir H. B. Hayes (q.v.) and Joseph Holt (q.v.).

ISABELLA, small vessel, was taken away by convicts at Port Macquarie in October 1823 and was not again heard of.

JENNY (205), American ship, left Port Jackson for Fiji for sandalwood. On 29 July 1808 she left Fiji, leaving ashore at Mbau Bay the well-known William Lockerby and 6 seamen. Lockerby remained there nearly 2 years before being rescued by *General Wellesley*, sandalwood trader, and has left an interesting journal of his stay 1808-9 (contemporary with Mariner). In 1809 *Jenny* was captured by H.M.S. *Dover* and sold as a prize.

JOHN (31), schooner, owned by Commissary Palmer, was lost about 1812.

LADY ELLIOTT, ship, in 1815 struck on a reef off Halifax Bay, Queensland.

LADY NELSON (60), colonial government brig, after very useful service on the Australian coast from 1800, was, it is supposed, captured by piratical natives of Baba, Serawatti group in 1825, and all hands were killed.

LADY SHORE, convict ship. In 1798, when bound for Sydney, was seized by mutineers, who turned the loyal people adrift in boats, which arrived safely at Rio de Janeiro. The mutineers took the ship to Monte Video and gave her up to the Spaniards, who hanged the ringleader and delivered others to English naval authorities. The loss of her stores occasioned much distress in Sydney. The ship was recaptured by H.M.S. *Tremendous* in 1801.

LADY TROUBRIDGE, whaling brig, of Liverpool, was wrecked in Blythe Bay, Desolation Island, South Shetlands, 25 December 1820. She was high and dry next year.

L'URANIE, French exploring ship, was wrecked off Falkland Islands, 15 February 1820. Survivors purchased an American ship and, with *La Physicienne*, sailed for France. The two ships were under command of Freycinet and had visited Australia and the South Sea Islands in 1818-19.

MANGALORE, ship, was lost off Sumatra, while bound for Sydney from India July 1813.

MARGARET, of Sydney, owned by Buyers and Turnbull. In 1803, while pearl-fishing, struck a reef supposed to be Opatiki Reef, Palliser Islands, Low Archipelago, and was totally wrecked.

MARTHA (30), bound from Lake Macquarie for Sydney, ran ashore and was wrecked off Little Manly in 1800.

MARY, ship, Captain Simmons, foundered off East Cape, New Zealand, 1810. All hands were saved.

MARY, coaster, was lost at Twofold Bay, where she was attacked by natives, 25 May 1821.

MASCARIN, French discovery ship under Marion du Fresne, in 1772 anchored in Bay of Islands, New Zealand, where du Fresne and 16 men were murdered by Maoris, on whom the French took summary vengeance.

MATILDA (460), ship, convict transport and whaler, left Sydney for Peru, December 1791, and was wrecked at night on a reef near Mururoa (Osnaburg Island), Low Archipelago, in 1792. There were 21 survivors.

MERCURY, colonial schooner, owned by Mrs. Reiby, was lost at Shoalhaven, March 1813.

MERSEY, bound from India for Tasmania with cattle, chartered by Governor King, was lost in Torres Strait, 1805.

NANCY, colonial cutter, was lost, 18 April 1805.

NEPTUNE, convict transport in Second Fleet, in July 1794 left Bombay with cattle and stores for Sydney, but was lost soon after her departure.

NORFOLK (25), sloop, in which Flinders and Bass sailed round Tasmania, was seized, November 1800, in the Hawkesbury River by convicts, who ran her ashore soon afterwards.

NORFOLK (56), brig, formerly *Harbinger*, purchased and renamed by King, May 1801, was driven ashore and wrecked during a hurricane in Matavai Bay, Tahiti, November 1801.

OTTER, Boston sealer, called at Port Jackson in 1796, took away with her one of the Scottish Martyrs, Muir, and was wrecked on the coast of British Columbia. Only Muir and 2 seamen survived, the rest of the crew being killed by Indians.

PANDORA, H.M.S., was wrecked, 28 August 1791, on Great Barrier Reef, near the north-eastern approach to Torres Strait and Pandora Opening, while returning from Tahiti to England with some of the *Bounty* mutineers aboard. She was under the notorious Captain Edwards. 35 lives were lost; 99 survivors sailed in boats to Timor, arriving there 16 September.

PHOENIX, grounded on Sow and Pigs Shoal, Sydney, and was condemned, 6 August 1824.

PLOOMER or EL PLUMIER, bought by J. F. Palmer (Scottish Martyr), left Sydney January 1801 drove on a sandbank in Thames River, Auckland, and took 26 weeks to repair. She was then seriously damaged on a reef at Mbau Island, Fiji. Arriving at Guam, 7 January 1802, she was condemned and Palmer died.

PORPOISE (originally *Infanta Amelia*, a Spanish prize), H.M.S., Lieutenant Fowler in command, Flinders a passenger; lost at Wreck Reef, 17 August 1803, in company with *Cato*, also lost. Flinders sailed in a boat to Sydney and brought *Rolla*, *Cumberland*, and *Francis* to rescue survivors.

PORT AU PRINCE, English privateer and whaler of Liverpool, originally of 96 men and 30 guns, was seized, 23 November 1806, by natives of Lefuka (Tonga) Islands, who killed 37 men and kept about 14 prisoners. William Mariner, one of the survivors, remained there till 1810, being well treated all the time. His description of the life in Mariner's *Tonga Islands* is very well known and is contemporary with Lockerby's *Journal of Fiji*.

PORTLAND. (See *Duke of Portland*.

PORTLAND, was lost on the Tasmanian coast, 23 September 1823, together with two lives.

PRINCESS CHARLOTTE, government brig, left Hobart for Sydney, 27 August 1820, but never arrived.

RECHERCHE, ship of D'Entrecasteaux. See *Esperance*.

RICHMOND (466), was wrecked in the Java Sea in 1822. She left Sydney for Batavia, 25 June 1822.

RIDDERSCHOP VAN HOLLAND, Dutch ship, left Cape of Good Hope for Batavia in 1694, and was not heard of again. Sometimes supposed to have been wrecked on Western Australian coast, where Vlaming searched for her in 1696.

ROEBUCK, H.M.S., under command of Dampier, anchored in Shark Bay and other localities in Western Australia. While returning to England she anchored off Ascension Island, where the old vessel sank in 1701. She 'perished through perfect age,' wrote Dampier.

ROYAL GEORGE, was wrecked off the Cape of Good Hope, August 1822, when on the way from Sydney to England.

SALLY, colonial schooner, was lost, 16 July 1812.

SAN ANTONIO, brig, struck on a reef off Palm Islands, Queensland in 1821, on her passage from Sydney to India in company with Captain P. P. King in the *Bathurst*. She was refloated and continued the voyage.

SERINGAPATAM, ship, was captured by the United

States raiding frigate *Essex* and sent to Marquesas Islands, whence, 6 May 1814, her prize crew navigated her to Sydney and delivered her to the government. Also see *Greenwich*.

SINBAD, coaster, was lost at Port Stephens, 20 October 1822.

SIRIUS (formerly *Berwick*), H.M.S., flagship with First Fleet to New South Wales, was wrecked in Sydney Bay on the southern side of Norfolk Island while landing stores from Sydney, 19 August 1790. All hands were saved, as well as most of the cargo. (See HUNTER, JOHN, and SIRIUS, H.M.S.).

SOPHIA, sealing schooner of Hobart, James Kelly master, in December 1817 had a quarrel at Port Daniel, Otago, New Zealand, with the Maoris, who killed 3 of the crew and then tried to seize the schooner, but were driven off, with the loss of 16 who were killed aboard and some 40 more who were drowned. Next day they again attacked the schooner and were again driven off with further loss. The crew of 14 men then went ashore, destroyed the village and many canoes, and then sailed away.

STEDCOMBE, English schooner. In 1825 the master and 3 seamen were left ashore on Melville Island, and the mate took her to Timor Laut in search of *Lady Nelson*. There all of them, except two boys, were murdered by natives. One of them, Forbes, lived there till rescued in 1839 by the resolute conduct of Captain Watson of schooner *Essington*.

SUPPLY, H.M. brig, tender to *Sirius* with the First Fleet, required such extensive repairs that she was sent to England, leaving Sydney, 26 November 1791 under Lieutenant Ball and arriving at Plymouth, 21 April 1792. She returned in 1795, and, after further service in New South Wales under command of Lieutenant Kent, was found to be so rotten that she was condemned in June 1797 as unfit for further sea service and was finally broken up in 1806.

SURPRISE, French schooner, from the Mauritius to hunt for seals in Bass Strait in 1803, was lost on Cape Barren Island, several of her crew being drowned.

SURREY, ship, from London with convicts, in July 1814 arrived at Port Jackson in distress. 33 people had died from fever and most of the crew were suffering from it. She was anchored in the harbour; her people landed on North Shore and remained there for nine months, many more dying, including the captain, chief officer, and surgeon.

SYDNEY (900), East Indiaman ship, left Sydney in April 1806, and was lost, 20 May 1806, on Sydney Shoal, south of Admiralty group, about 3¼° S., 146¾° E. She struck on it at night, while bound to India from Sydney for rice to Governor King's order. All were saved in boats and sailed to the Admiralty group.

SYDNEY COVE, East Indiaman ship, from Bengal to Sydney, sprang a leak, 8 February 1797, and was beached at Preservation Island, Furneaux group. 12 of her Lascar crew perished while trying to reach Sydney, 3 whites only surviving. 25 men were rescued in the *Francis* in July. With her was *Eliza*, longboat, which took a few men and foundered with all hands. In February 1798 Flinders went in the *Francis* and took away the remaining 5 men. See CAMPBELL, ROBERT.

SYREN, whaler, Captain Coffin, was nearly cut off, 31 March 1823, by natives of Pelew Islands, 100 of whom came aboard and, when opportunity occurred, suddenly attacked the crew of 37 men. These drove them off after desperate fighting, in which 2 petty officers were killed and nearly everyone wounded.

TELLICHERRY (468), ship, left Sydney bound for China, April 1806, and was lost on the voyage.

THREE B's (or BEES), ship, was burnt in Sydney Cove, 20 May 1814. She drifted over to North Shore, after some of her guns had fired and landed shot in Bridge-street. Fire reached her magazine and she was blown up.

TRIAL, brig, owned by Simeon Lord, was seized by convicts, 12 September 1816, and afterwards wrecked in Trial Bay, New South Wales, where all perished, including her crew, a few passengers, and convicts. The wreck was found by *Lady Nelson* in the bay.

TRIALL or TRYAL, English ship, was wrecked on a reef off Western Australia, supposed to be Monte Bello Reef off Barrow Island. In July 1622 her boat with 10 men and pinnace with 36 men arrived at Batavia, having left in the ship 97 people who have not been heard of again. This is the first authentic wreck of any European vessel on the Australian coast.

UNION, American sealing vessel at Kangaroo Island, South Australia, 1803-1804, under charter to Simeon Lord of Sydney, sailed to Tongatabu for sandalwood, 29 August 1804, and there the captain and boat's crew were murdered. She returned to Sydney and sailed for Fiji, where all the crew were massacred and the vessel taken by savages and wrecked on Koro Island, November 1804.

UNITY, was seized by convicts in April 1813 in Derwent River, Tasmania, and taken away by them.

VALETTA, from Sydney for Manila, struck on Great Barrier Reef, 10 July 1825, and was beached near Cape Gloucester.

VENUS (142), brig, owned by Waterhouse and Bass. Bass left Sydney in February 1803, probably for Chile, and then passes from our ken. Possibly Spaniards seized the brig off Peru and made a prisoner of Bass.

VENUS (45), colonial brig, was piratically seized, 16 June 1806, by a portion of her crew and some convicts at Port Dalrymple, who sailed her to New Zealand, where they burnt her and lived ashore until recaptured years later.

VENUS (20), colonial schooner, owned by J. McArthur. Her crew of 3 men were captured by Tahitians in 1809; shortly afterwards, October 1809, she and her crew were recaptured by Captain Campbell of the *Hibernia* and taken back to Sydney.

VEEGULDE DRAECK (*Golden Dragon*), Dutch ship from Holland to Batavia, on 28 April 1656 was wrecked on the Western Australian coast, in lat. 30° 40′ S. 118 lives were lost by drowning; 7 survivors reached Batavia, but about 60 others, who landed on the mainland, were never again heard of. In searching for survivors in July and August the yacht *Good Hope* lost 11 men, and in 1658 the *Waeckende Boey* lost boats and 14 men.

VICTORINE (75), left Sydney for Hobart, 24 August 1822, and never arrived.

WAECKENDE BOEY. See *Vergulde Draeck*.

WESEL. See *Amsterdam*.

ZEEWYK, Dutch ship, was wrecked on Pelsart Island, Abrolhos group, in 1727. The crew built a sloop and reached Batavia safely. Captain Wickham in 1840 found on Gun Island in Pelsart Lagoon various Dutch articles probably left by them.

ZUYTDORP, Dutch ship, is supposed to have been wrecked on the Abrolhos, Western Australia, in 1711.

SECTION II

LOSSES ROUND AUSTRALIAN COAST BETWEEN JANUARY 1826 AND AUGUST 1926

AAGOT (1155), Norwegian barque, was wrecked on Wardang Island, South Australia, 12 October 1907, when bound for Port Victoria. No lives were lost.

ABBEY (90), schooner, was wrecked near Crowdy Head, 15 February 1868 during heavy SE. gale

ABEONA, barque, was wrecked on King Island, Bass Strait, in 1877. No lives were lost.

ABERDEEN (375), barque, of Sydney, became missing in 1874.

ABILITY (48), schooner, of Sydney, was wrecked during a SE. gale at Cape Hawke, May 1897.

ABORIGINE (131), brigantine, of Melbourne, was wrecked in 1873.

ABSTAINER (49), ketch, was wrecked off Gippsland Lakes, November 1889.

ACACIA (200), barque, left Port Esperance for Adelaide, 20 June 1904, and was not heard of for nine months, when the wreck and several bodies were found at Mainwaring, Tasmania. There were violent gales soon after she left.

ACME, schooner, was lost in Seal Rock Bay, New South Wales, in July 1876. All hands were saved.

ACTIVE (136), brigantine, of Sydney, was wrecked in 1871.

ACTIVE (49), ketch, of Sydney, foundered after striking a submerged object at the entrance to Newcastle Harbour, January 1898.

ACTIVITY (62), ketch, was wrecked off Western Australia, July 1892.

ADA, barque, sunk in collision with P. & O. s.s. *Jeddo*, 17 July 1865, off Garden Island, near Fremantle.

ADA (50), ketch, was wrecked in the Gulf of Carpentaria, April 1888.

ADALIA, schooner, was wrecked in a hurricane, 9 January 1880, near Yammadery Creek, Western Australia. 1 life was lost.

ADDERLEY, barque, was wrecked at Morna Point, near Newcastle, 23 April 1897. She was refloated, 16 February 1898.

ADELA (353), barque, of Newcastle, stranded in Richmond River near Lismore, July 1877.

ADELAIDE, was lost off Hawkesbury River, 1 July 1837.

ADELAIDE (307), schooner, of Sydney, left Newcastle for Gisborne, May 1898, and became missing. 7 lives were lost.

ADELPHOI (349), barque, of Newcastle, was wrecked at Port Hacking, 21 December 1879.

ADIEU (59), cutter, foundered in Trinity Harbour, Cairns, April 1895.

ADIEU (174), brigantine of Melbourne, became missing in 1883.

ADMELLA, s.s., was lost off Cape Northumberland, 4 August 1859, on a voyage from Adelaide to Melbourne. 24 lives were saved; 83 lost.

ADOLPHE, French 4-masted barque, was wrecked on northern breakwater, Newcastle, 30 September 1904. All lives were saved by lifeboat. She was eventually built into the breakwater.

ADOLPHUS, brigantine, was wrecked, 29 November 1866, through drifting ashore at Wollongong during a light breeze.

ADONIS (108), brigantine, foundered off Crowdy Head, December 1889.

ADVANCE, colonial cutter, was wrecked in Brisbane Water, 22 February 1838.

ADVANCE, schooner, was lost in Botany Bay, 11 February 1884. She missed stays and then parted her cable.

ADVANCE (51), schooner, was wrecked at Botany Heads, 14 June 1902.

ADVANCE, tug, was run down and overturned by ship *Iverna*, 25 December 1908, off Newcastle. 7 lives were lost, and there was only one survivor, who floated all night. As a tug was about to take her in tow, tug-master (drowned) was blamed for the collision.

ADVANCE (36), schooner, was blown ashore at Wreck Bay and became a total wreck, March 1915.

ADVENTURER (305), barque, of Sydney, was broken up at Thursday Island, May 1881.

AEOLUS, ship, was wrecked on Cape Banks, 3 October 1894.

AFRIC (12), schooner, of Fremantle, foundered at King Sound in 1915.

AFRIC (9), lugger, of Darwin, was wrecked in Bowon Strait, at Croker Island, February 1915.

AFRICAINE, was wrecked in Port Phillip about January 1840.

AFRICAN MAID (143), brig, of Melbourne, was wrecked on the Queensland coast, January 1878.

AGINCOURT (443), barque, of Adelaide, was wrecked at Hamelin Bay, April 1882.

AGNES, Sydney to Mauritius, was wrecked in Torres Strait, 16 August 1834.

AGNES (316), barque, of Adelaide, was wrecked at Rivoli Bay, July 1876.

AGNES (104), brig, of Sydney, was wrecked at Wollongong, March 1877.

AGNES (80), schooner, foundered off Brunswick River, March 1890. All hands were lost.

AGNES (43), schooner, was wrecked at Bremer Bay, April 1892.

AGNES, motor launch, sank in Sydney Harbour, 28 January 1906. Two lives were lost.

AGNES IRVING (333), paddle steamer, of Sydney, was wrecked at Macleay River, 28 December 1879. She took the bar at half flood.

AGNES WILSON (370), barque, was wrecked on Mersey Heads, July 1883.

A. H. BADGER (337), barque, from Newcastle to Auckland, in October, 1871, sank in Tasman Sea through collision with United States s.s. *Nevada*, which neither stopped to save life nor reported the collision on arrival at Sydney. All hands took to boats, were saved by the barque *Alice Cameron*, and landed at Sydney. *Nevada* was fined £1600 and costs.

AIRLIE (236), schooner, was burnt at Ashburton, January 1889.

AJAX (536), barque, of Melbourne, became missing about 1879.

ALADDIN, coaster, was wrecked in Sydney Harbour, April 1837.

ALBANY (460), s.s., of Adelaide, was wrecked near Nambucca Heads, 26 March 1905, on a voyage from Sydney to Brisbane. No lives were lost. She was proceeding too close inshore and struck a reef during the afternoon.

ALBATROSS (61), schooner, was wrecked at Port Victoria, March 1913.

ALBERT (42), ketch, sank off Port Phillip Heads, August 1890.

ALBERTA, s.s., was wrecked on Cudgeon Reef, Tweed Heads, October 1890.

ALBERT VICTOR (384), barque, of Melbourne, was wrecked on Lacepede Islands, March 1877.

ALBION (170), schooner, was wrecked near Port Hacking, 20 March 1867. 5 lives were lost, 2 saved.

ALBION (263), barque, of Sydney, was wrecked in 1874.

ALCANDRE (194), brigantine, of Melbourne, was wrecked at Waratah Bay, August 1877.

ALCYON, was wrecked in Geographe Bay, 5 August 1844, through her cables parting in a heavy gale. All hands were saved.

ALDERGROVE (1271), barque, stranded off Point Malcolm, 3 May, 1880, and was refloated. She was almost completely destroyed by fire at Newcastle in June 1899, but was repaired. At the same place another serious fire occurred aboard in August 1903. She was totally lost off Peru, May 1905.

ALDINGA (259), s.s., was wrecked on Bellambi Reef, 27 January 1896.

ALEDA (79), schooner, was wrecked at Plomer Point, near Port Macquarie, 15 June 1914, during a southerly gale. All hands were lost.

ALERT (116), s.s., foundered off Cape Schanck, 28 December 1893. There was only one survivor.

ALERT (18), s.s., was wrecked at Nambucca River, 28 July 1904.

ALEXANDRA (254), brigantine, of Melbourne, was wrecked in 1872.

ALEXANDRA (287), brigantine, of Fremantle, was wrecked near Rabbit Island, with no lives lost. Inquiry was held April 1878. Master and mate were convicted of attempting to scuttle vessel, and were sentenced to three years' and one and a half years', hard labour respectively.

ALEXANDRA (239), brig, of Melbourne, was wrecked at Warrnambool, March 1882.

ALEXANDRA (496), s.s., of Sydney, sank near Townsville in January 1905.

ALEYAI, American ship, was wrecked in 1858 on North West Reef, Prince of Wales Channel, Torres Strait, and formed a most useful mark for many years.

ALFHILD, Swedish barque from Rio de Janeiro for Hobart, was wrecked on the western coast of Tasmania, 10 October 1909. 5 men were drowned, 7 perished ashore, 6 survived.

ALFRED AND LIZZIE (30), barge, was wrecked at Hope Beach, Tasmania, August 1894.

ALFRED FENNING (74), ketch, left Sydney, 16 June 1914, and was never heard of again. All hands were lost.

ALHAMBRA (497), s.s., foundered off Port Stephens, July 1888.

ALICE (20), sloop, was piratically taken in Sydney, 21 October 1835.

ALICE, schooner, was wrecked off Nobby's, Newcastle, 2 April 1861. No lives were lost.

ALICE, ketch, of Sydney, was wrecked on Sow and Pigs Shoal, Sydney Harbour, July 1877.

ALICE, launch, was wrecked at Launceston, 2 April 1907. 10 lives were lost.

ALICE (13), cutter, was wrecked on Intercourse Island, northern Australia, December 1891.

ALICE, schooner, was wrecked on Bruce Reef, Western Australia, 14 June 1915. 13 lives were lost.

ALICE JANE, schooner, was found bottom up on the beach near Port Hacking, 15 January 1874. All hands were lost.

ALICE JANE (80), schooner, was wrecked at Tomakin, January 1888.

ALICE MAUD (205), brig, of Melbourne, was wrecked on a voyage from Greymouth to Melbourne, on Cape Barren Island, Bass Strait, September 1874.

ALICE PLATT, barque, stranded off Kingscote, Kangaroo Island, 9 February 1879.

ALIGUIS, Sydney to Calcutta, was wrecked in Torres Strait, May 1839.

ALMA, barque, was wrecked on King Island, Bass Strait, in 1873. No lives were lost.

ALPENA, U.S.A. schooner, dragged her anchors close inshore off Stockton, Newcastle, in an easterly gale, 27 September 1909. All the crew were gallantly taken off by lifeboat. She rode the gale out safely and was removed next day.

ALPHA (82), schooner, of Sydney, was wrecked at Nambucca River, February 1897.

AMELIA J. (353), schooner, left Newcastle for Hobart with coal, 21 August 1920, and was not heard of again. Twelve hands were lost.

AMELIA WHITE (94), schooner, of Sydney, was wrecked near Camden Haven in 1898.

AMERICA, cutter, from Queensland to Bampton Reef, Coral Sea. On her return, in making Torres Strait, she was wrecked, probably on Entrance Island, about April 1839. Her crew of 5 men were lost, but one woman was saved by the natives and lived with them until rescued by H.M.S. *Basilisk* in 1849.

AMETHYST, lugger, with missionaries aboard, was wrecked off Arnhem's Land, 1 July 1921. No lives were lost.

AMICUS (140), schooner, of Adelaide, was wrecked off Port Phillip, March 1857.

AMIE FLORENCE (657), barque, of Adelaide, became missing in 1903.

AMITY, ketch, left Sydney and is supposed to have foundered in heavy SE. gale off Manning River, 6 May 1870, with loss of all hands.

AMPHITRITE (129), barque, was wrecked at Port Stephens, March 1891.

AMY, ketch, capsized on Manning River Bar, October 1879.

AMY (220), brig, was wrecked on Thirroul Beach,

Bulli, 13 February 1898. All hands were lost.

AMY (38), s.s., was wrecked at St. Helens, Tasmania, February 1911.

AMY LOUISE (32), s.s., sank at Beby Island, Tasmania, February 1916.

ANAHUAC, ship, stranded on Darnley Island, Torres Strait, June 1891.

ANN, schooner, coaster, was wrecked at Newcastle about 1835.

ANN, schooner, was wrecked at Macleay River in 1839.

ANN (135), brigantine, of Melbourne, was wrecked in 1871.

ANN (277), barque, of Melbourne, was wrecked off Port Stephens, 25 July 1876, with her crew of 10 lost.

ANN, schooner, was burnt at Brisbane, in 1876.

ANNA (144), barque, of Melbourne, was wrecked on King Island, Bass Strait, October 1873.

ANNANDALE (108), ketch, foundered off Smoky Cape, 12 March 1907. No lives were lost.

ANNE (35), schooner, of Melbourne, was wrecked near Loutit Bay, February 1863.

ANNE (102), schooner, was wrecked on the north-western coast of Australia, January 1894.

ANNE AND MARY (185), brigantine, foundered off Ninety Mile Beach, 26 June 1887 after springing a leak. 2 lives were lost.

ANNE MOORE (90), brigantine, was wrecked at Clarence River, July 1889.

ANNE THERESA (64), schooner, was wrecked at Byron Bay, February 1891.

ANNIE, was wrecked in Torres Strait in 1854.

ANNIE (470), barque, was wrecked at North Head, Sydney, 29 June 1858. No lives were lost.

ANNIE (201), schooner, of Hobart, was wrecked at Bird Island, August 1882.

ANNIE, ketch, stranded on the eastern side of Tasmania, 9 August 1887. She had run along too close to land, and her anchor ring parted.

ANNIE, steam launch, was wrecked at Tweed Heads, 3 July 1903.

ANNIE C. LYNN (54), schooner, was wrecked at Brunswick River, May 1891.

ANNIE COCHRANE (50), schooner, was wrecked on M Reef off Claremont Islands, March 1891.

ANNIE D., schooner, left Sydney for Richmond River, 27 August 1868, and was never heard of again.

ANNIE LISLE (324), barque, of Adelaide, was wrecked on Rottnest Island, 20 May 1887, after collision, while at anchor, with s.s. *Australia*, which was held to blame.

ANNIE OGLE (210), brig, foundered near Smoky Cape, March 1875. 9 lives were lost.

ANNIE POWELL (123), schooner, foundered off Five Islands, 5 August 1886, after springing a leak.

ANN JAMIESON, brig, blew up at King's Wharf, Sydney Harbour, 30 November 1833. 6 were killed.

ANN MARY, schooner, was found bottom upwards in 1847, and was towed to Sydney Heads, where her anchors, hanging down, caught the ground, and broke the tow-line. She was again taken in tow and righted in the harbour.

ANONYMA (75), pilot schooner, was wrecked near Point Lonsdale, Port Phillip, 2 October 1859. The pilot apprentice was dismissed the service.

ANSON, H.M.S., 74 guns, old prison ship, was sold at Hobart and broken up in 1850.

ANTAGONIST, was wrecked on Green Islet Reef, Banks Channel, Torres Strait, 14 May 1863.

ANTARES, schooner, was wrecked on Flinders Island, Bass Strait, 1853.

ANTARES (1750), ship, formerly *Sutlej*, Italian owned sailer, from Marseilles to Melbourne, and is supposed to have foundered in Bass Strait, December 1914. All hands were lost.

ANTONIETTE CEZARD, French ship; was carried by the tide on to a reef and sank off Shortland Bluff, Port Phillip, 29 April 1854. The cargo was salvaged, and the ship refloated and repaired in Melbourne.

APOLLO, brig, was lost on the Tasmanian coast, March 1827.

ARABIAN (1400), American ship, was totally destroyed by fire at Sandridge Pier, Melbourne, 12 November 1860.

ARBUTHNOT (41), paddle steamer, was burnt at Murrumbidgee Junction, November 1913.

ARCHIMEDES, schooner, was wrecked near Townsville, February 1893.

ARGO, barque, was blown up by coal gas explosion in Neutral Bay, Port Jackson, 24 July 1893, one life being lost. She was converted into a coal hulk.

ARGUS, s.s., under charter to Eastern and Australian Line, was wrecked on a reef off Home Islands, 26 July 1895.

ARGYLE, s.s., was wrecked at the entrance to Clarence River, 25 July 1881.

ARIEL (120), schooner, of Melbourne was burnt off Cape Schanck, May 1861.

ARK (44), ketch, of Adelaide, in November 1881 foundered off Dangerous Reef, South Australia, through the carrying away of her rudder head.

ARROW, schooner, previously called *The Dart*, from the Mauritius to Australia, was wrecked at King Island, 1865. She mistook Cape Wickham light for Otway. No lives were lost.

ARTHUR, ketch, of Sydney, was lost with all hands while entering Newcastle Harbour in heavy weather, 13 July 1866.

ARTHUR THE GREAT, ship, stranded at Port Phillip Entrance in 1856.

ASA PACKER, barque, was lost on Point Nepean, 24 May 1861.

ASTEROPE, barque, was wrecked on Hebe Reef, at the mouth of the Tamar River, 8 June 1883. The wreck was due to careless navigation and neglect of the lead.

ASTRAL, s.s., foundered off Broken Bay, 6 April 1924. One life was lost.

ATACAMA (1147), barque, of Liverpool, left Newcastle for San Francisco and foundered in Tasman Sea, 9 February 1898. 5 men were rescued after being several days in a boat; 13 were lost.

ATHOL, s.s., was wrecked on Rocky Island, Queensland, 3 February 1894.

ATLANTIC, schooner, from Richmond River to Sydney, was found floating bottom up near Sydney, 20 September 1876. There were no survivors.

ATLANTIC (260), barque, of Sydney, was wrecked at Trial Bay, September 1878.

AUCKLAND (533), s.s., on voyage from Melbourne to Sydney was wrecked on Beware Reef, Ninety Mile Beach, 25 May 1871. The compasses had not been readjusted after the ship had undergone extensive alterations and repairs.

AU REVOIR (138), brigantine, of Sydney, was wrecked at Mackay, June 1884.

AURHAUS, barque, was wrecked on Smith Rock, Cape Moreton, 24 February 1894.

AURORA (138), brigantine, of Sydney, foundered on the coast of New South Wales in 1887.

AUSTRAL (5580), s.s., sank in Neutral Bay, Port Jackson, 11 November 1882, and was refloated, 23 February 1883. She took a heavy list while coaling, and water poured into her lower ports. 5 lives were lost.

AUSTRALIA (162), barque, of Sydney, was wrecked in 1873.

AUSTRALIA (124), schooner, of Sydney, was wrecked at Richmond River, 11 February 1874.

AUSTRALIA (283), s.s., of Dunedin, was wrecked off Tasmania, April 1899.

AUSTRALIA, schooner, stranded in Manning River, 16 June 1904, but was refloated.

AUSTRALIA (6000), R.M.S., was wrecked at Port Phillip Heads, 21 June 1904, while in charge of the pilot. Much cargo was salvaged by blowing the ship to pieces. No lives were lost.

AUSTRALIAN (2838), Eastern and Australian s.s., was wrecked on Bachon Head Reef, 30 miles from Darwin, 17 November 1906, on a voyage from Sydney to Hong Kong. No lives were lost, but there was considerable difficulty in landing in boats on account of strong tides.

AUSTRALIA (92), schooner, was wrecked on South West Rocks, Trial Bay, 22 February 1911.

AUSTRALIAN (22), schooner, built in 1825, was wrecked in 1875.

AUSTRALIAN, left Sydney in 1889, but has not since been heard of.

AUSTRALIAN (191), s.s., was wrecked at Wardang Island, May 1912.

AVON (72), paddle steamer, was wrecked at Bellinger River, June 1891.

AWAROA (352), s.s., of Melbourne, was abandoned off Cape Liptrap, on voyage from Launceston to Melbourne, 23 July 1925. The crew were taken off by s.s. *Huntingdon*.

BADGER. See *A. H. Badger*.

BALCLUTHA (262), s.s., foundered on the coast of New South Wales, October 1881. She was proceeding from Melbourne to Sydney, heavily loaded with blue stone, and was last seen off Gabo Island, smothered in spray, in heavy SW. gale. 22 lives were lost.

BALLINA (190), paddle steamer, of Sydney, was wrecked while going out of Port Macquarie, February 1879.

BAMBA (20), ketch, of Townsville, was wrecked in 1916.

BANNOCKBURN (111), brigantine, of Rockhampton, was wrecked at Byron Bay, July 1889.

BANSHEE, s.s., was wrecked in strong gale off Townsville, 21 March 1876. 17 lives were lost.

BARCOO, s.s., for many years in interstate service

and for a number a coal hulk in Sydney, was towed to sea and sunk off Port Jackson, 1 February 1924.

BARRANGARRY (71), ketch, was wrecked at Port Macquarie, April 1891.

BARWON (56), schooner, foundered during easterly gale, 15 February 1868, all the crew being lost.

BARWON, paddle s.s., of Sydney, was wrecked at Cape Bridgewater, April 1871 while on voyage from Adelaide to Sydney, owing to careless navigation in foggy weather. She had been stranded in June 1866.

BAT (194), brig, of Sydney, became missing in March 1882.

BATHURST BAY. A hurricane on 5 March 1899 destroyed a large number of pearling vessels anchored off Bathurst Bay near Cape Melville. About 350 lives were lost. See *Pearling Luggers*.

BEATRICE (419), brigantine, was wrecked in Brisbane River, 1896.

BEGA (305), s.s., foundered between Bermagui and Tathra, 5 April 1908. One life was lost.

BELGOWRIE, s.s., ran ashore in a storm 5 miles north of Cronulla, 26 June 1923. She was refloated next week.

BELLA BEATON (10), cutter, was burnt at Flinders Island, Bass Strait, in 1911.

BELLATA (1803), s.s., of Sydney, was converted into a hulk, July 1923.

BELL BIRD (57), ketch, of Sydney, was wrecked at Cape Hawke, May 1897.

BELLE (198), brigantine, of Melbourne, was wrecked at Ramsay Bay, January 1880.

BELLE ISLE (1180), ship, of Liverpool, was abandoned sixty miles off Sydney, 14 April 1872. Straining in heavy gale caused her to leak; the pumps became choked with sand ballast, which shifted and threw her on her beam-ends, so that she foundered. The crew were saved.

BELLFLOWER, was wrecked at Newcastle, 9 July 1904, but was refloated.

BELLINGER, s.s., was sunk by a collision in Port Phillip, 22 April 1892.

BELLINGER (100), ketch, was wrecked at Stradbroke Island, 5 May 1892.

BELLINGER (125), s.s., was wrecked at Macleay River September 1918.

BELLINGER (141), s.s., was wrecked at Nambucca River Heads, 26 April 1912.

BELMORE (42), paddle steamer, was wrecked in Coffs Harbour, March 1893.

BELMORE, s.s., was wrecked on Macleay River Bar, 9 December 1916, during NE. gale and rough sea. The crew landed safely after their boat had capsized near the shore.

BENANDRA (345), s.s., ran ashore on a sandspit, at the entrance to Moruya, 5 March 1924, and became a total loss. One man was lost.

BENELON (204), vehicular ferry s.s., sank in a collision in Sydney Harbour, 17 May 1923. She was raised next week. No lives were lost.

BENGAL (307), barque, of Rockhampton, was stranded and wrecked on Great Barrier Reef, 6 August 1886. An inquiry was held at Rockhampton.

BEN LEDI, ship, was wrecked on Pelsart Island, Abrolhos, 16 December 1879.

BEN NEVIS (257), brig, of Melbourne, was wrecked at Port Stephens, 3 July 1875.

BERBICE (717), ship, of Greenock, was wrecked at Oyster Bank, Newcastle, 6 June 1888. All the crew were saved by rocket apparatus.

BERENGARIA (422), barque, of Sydney, was wrecked in 1873.

BERLINDA, ketch, left Wagonga for Sydney, 16 April 1884, and was totally wrecked in crossing the bar, in consequence of the wind failing and anchors dragging.

BERMAGUI MYSTERY, government survey, with a party of four men, disappeared in October 1880, their boat, books, letters, etc., being found on the beach at Bermagui, New South Wales. Nothing was ever heard of them.

BERRINGA (1847), s.s., of Melbourne, was converted into a hulk in 1923.

BERTHA, schooner, was wrecked near Wollongong in a gale, September 1879.

BERTHA (87), schooner, was wrecked at Nambucca River, August 1891.

BESSY, schooner, was wrecked at Newcastle in 1844.

BETHANGA (1846), s.s., of Melbourne, was converted into a hulk in 1923.

BINGLE (9), lugger, was wrecked at Roebuck Bay in 1910.

BIRKENHEAD (78), s.s., was wrecked in Sydney Harbour in 1913.

BISMARCK, schooner, of Sydney, was lost at the mouth of Nambucca River, owing to tow rope parting, in 1878.

BLACKBIRD (531), s.s., of Sydney, was wrecked at Ninety Mile Beach, 2 June 1878. No lives were lost.

BLACK BOY, tug, was lost on Lonsdale Reef, Port Phillip Heads, 8 July 1883, through wreckage fouling the propeller.

BLACK DIAMOND (100), s.s., of Sydney, was wrecked in 1872.

BLACK DUCK, ketch, was wrecked at Cronulla in 1853.

BLACK EAGLE, paddle steamer, collided with s.s. *Barwon* in the Yarra River, through the helm being put over the wrong way, June 1866.

BLACK EAGLE, s.s., sprang a leak and was beached near St. Kilda Pier, Port Phillip, where she became a total wreck, 26 December 1884.

BLACK SWAN, s.s., on a voyage from Melbourne to Launceston, July 1867, was sunk in collision with the paddle steamer *Luna* off Williamstown. She was refloated, but was totally lost on Manning River Bar, 4 June 1868.

BLACKWALL (45), s.s., was lost in Seal Rock Bay, New South Wales, in July 1876. All hands were saved.

BLANCHE, H.M.S., was almost totally wrecked on a coral-reef a few miles from Cape York in 1870.

BLANCHE (12), schooner, was wrecked at Cape Bossut, May 1917.

BLENCATHRA (899), barque, while on a voyage from Glasgow to Sydney, was totally wrecked on King Island, owing to the master having mistaken Cape Wickham light for Cape Otway light, January 1875. No lives were lost.

BLUE BELL (12), schooner, was wrecked at Broome, 19 November 1910, during a hurricane.

BLUE BELL (12), schooner, was wrecked at Broome, in 1874.

BLUE BELL (76), s.s., was wrecked on South Keppel Rock, near Rockhampton, 11 February 1877.

BODALLA (345), s.s., of Sydney, was wrecked on the bar at Narooma, 19 January 1924.

BONNIE DUNDEE (121), s.s., of Sydney, was sunk by s.s. *Barrabool*, 8 miles south of Newcastle, 10 March 1879, 5 lives being lost.

BOOMERANG, schooner, left Newcastle for Clarence River, 12 January 1865, and was never heard of again. 5 lives were lost.

BOREALIS (131), brigantine, was wrecked near Townsville, November 1888.

BOUND TO WIN (32), ketch, foundered at Port Stephens, October 1893.

BOWRA (140), s.s., foundered at Seal Rocks, 27 October 1894. There was no loss of life.

BRAESIDE, wooden schooner, built in a dastardly manner at Sydney during the war, was found to be utterly unseaworthy and therefore was towed out to sea and burnt, 1 December 1923.

BRAHMIN, ship, was wrecked at King Island, Bass Strait, 25 May 1854. No loss of life occurred.

BRAVO (207), brigantine, of Melbourne, was beached at Waratah Bay, 28 May 1877, having sprung a leak. All hands were saved.

BREADALBANE (215), barque, was wrecked at Bellambi, New South Wales, 1 October 1864, through her cables parting in a heavy gale.

BRIER HOLME (894), iron barque, London to Hobart, was wrecked on night of 5 November 1904, off Elliott Cove, SW. Tasmanian coast. It is supposed that after striking a reef a heavy explosion of dynamite in her cargo took place. There was only one survivor, 20 lives being lost.

BRIGHTON (17), ketch, of Townsville, was wrecked in Torres Strait, June 1911.

BRILLIANT, schooner, was wrecked on the beach at Cape Byron in July 1876. No lives were lost.

BRILLIANT (140), schooner, of Sydney, was wrecked at Brunswick River, 2 May 1884, through the anchors dragging in a gale.

BRINAWARR (73), s.s., of Sydney, was wrecked at Mackay, January 1918.

BRISBANE (18), schooner, was lost off Ulladulla, with all hands, July 1832. She was found capsized in Jervis Bay.

BRISBANE, s.s., was lost on Fish Reef, Northern Territory, 9 October 1881.

BRISTOL, brigantine, of Sydney, was wrecked at Cape Schanck, August 1858.

BRITISH ADMIRAL (1781), ship, was wrecked at King Island, 23 May 1874, on her second voyage from London to Melbourne. 79 were lost, 9 saved. A board of inquiry had reason to believe that her chronometers had been affected by heavy weather, and recorded that the master and officers were careful seamen.

BRITISH MERCHANT, Duthie's ship, when lying at the wharf, Miller's Point, Sydney, caught fire, was towed to Cremorne, scuttled, and sunk, 2 September 1860. Her hull was raised in 1869.

BRITON (452), lighter, of Melbourne, sank about 1884.

BRITTANIAR (*sic*) (24), tug, foundered two and a half miles east of Sydney Heads, 19 January 1921.

BROLGA (219), s.s., trawler of Sydney, while on

voyage from Melbourne to Sydney, was wrecked on Beware Reef, 12 August 1926. No lives were lost.

BRONZEWING (78), ketch, was wrecked at Fraser River, King Island, Bass Strait, 11 November 1914.

BROOKLYN (35), s.s., was wrecked at Crookhaven Head, 16 December 1911.

BRUNETTE (375), barque, of Melbourne, was scuttled and sunk, July 1913.

BRUNSWICK (118), s.s., of Sydney, was wrecked on Manning River Bar, 18 December 1886.

BRUTHEN, ship, was wrecked at King Island in 1854.

BUDGAREE (87), ketch, was wrecked at Beagle Bay, June 1891.

BULLI (496), s.s., of Sydney, was wrecked at North East Island, Kent group, Bass Strait, 28 June 1877.

BULWARK (1298), barque, of Melbourne, foundered at sea in 1882.

BUNDARRA (1809), s.s., of Sydney, was converted into a hulk, August 1924.

BUNINYONG, s.s., collided with barque *Crifel* in tow of the tug *Advance* off Bradley Head, Sydney, and was beached off Elizabeth Bay to prevent sinking, 5 May 1906.

BUNYIP (39), s.s., was wrecked at Manning River, November 1889.

BUONAPARTE, schooner, was abandoned off Bellambi, 17 November 1864.

BUONA VISTA, bêche-de-mer fishing schooner, while on a voyage from Port Nicholson to Torres Strait in 1849, was lost on Percy Island.

BURHAMPOOTUR, ship, of Port Phillip, was wrecked in 1843.

BURNETT (137), brig, of Sydney, foundered in Newcastle Bight with loss of all hands, during a heavy SE. gale, 9 May 1869.

BURRAWONG (246), s.s., was wrecked at Manning River, 27 March 1909. She collided with the breakwater and sank.

BUSTER (305), brigantine, was wrecked at Woolooga in 1893.

BUTESHIRE, s.s., was damaged by fire at Smith's Wharf, Miller's Point, Sydney, 19 October 1898.

BYRON (99), schooner, of Sydney, sprang a leak and foundered off Redhead, near Newcastle, 25 May 1896.

CADET (11), s.s., foundered in Sydney Harbour in 1912.

CAHORS (541), A.S.N. Co. s.s. of Sydney, was wrecked at Evans Head, 10 June 1885. The master's certificate was suspended for six months.

CAINAWON, barque, was wrecked at King Island, 15 September 1910.

CAIRO (57), s.s., was wrecked at Brunswick River, August 1893.

CALEDONIA, coaster, was piratically seized at Moreton Bay, December 1831.

CALEDONIA, schooner, of Sydney, dragged anchor during a gale and was driven on to a sandbank in Port Stephens. An inquiry was held at Sydney, 30 July 1877.

CALEDONIA (46), schooner, foundered off Bungaree, or Norah Head, April 1894.

CALLENDER (138), brigantine, of Sydney, was wrecked near Richmond River, June 1871.

CALLIANCE, ship, carrying colonists from Melbourne to Camden Harbour, north-western Australia, in 1864, was wrecked there, the captain being the only one to lose his life.

CALYPSO, brig, owned by H. Fisher of Sydney, was lost in 1849.

CAMBRIAN, ship, was wrecked, 19 October 1870.

CAMBRIDGESHIRE, was wrecked on Night Island, near Preservation Island, in 1875. All were saved.

CAMBUS WALLACE, barque, was wrecked on Stradbroke Island, 4 September 1894. 5 lives were lost.

CAMDEN (235), barque, was wrecked near Ulladulla, 30 January 1870.

CAMILLE (365), barque, of Newcastle, was broken up in 1919.

CAMPERDOWN (993), troopship, stranded on Swan Spit, Port Phillip Entrance, 17 October 1854. Part of the 12th regiment was aboard. She was refloated next day and went to Melbourne.

CANASTOTA (4904), American s.s. (formerly *Falls of Orchy*), left Sydney, 13 June 1921 for Wellington. No more was heard of her; 49 lives were lost. She had part cargo of benzine aboard, and it is supposed that she perished through fire and explosions.

CANBERRA (7710), s.s., was badly damaged by fire while alongside the wharf at Darling Harbour, Sydney, May 1925. One life was lost. It took 12 months to repair damage.

CANDIDATE (86), ketch, was wrecked while entering Port Macquarie, October 1894. 2 lives were lost.

CANDIDATE (86), ketch, left Camden Haven for Sydney, and was not since heard of, July 1912. 5 lives were lost.

CAPELLA (23), yacht, was stolen from her moorings in Rushcutter Bay, Sydney, during the night and was found wrecked near Outer North Head, Port Jackson, 23 December 1925.

CAPE PIGEON, cutter, was wrecked at King Island, Bass Strait, in 1874.

CAPE PIGEON (26), barge, was wrecked in Frederick Henry Bay, March 1895.

CAPE VERDE (1711), ship, of Glasgow, sank in Port Phillip in 1892, after collision while at anchor off Williamstown. She was raised again next year.

CAPTAIN COOK (74), schooner, of Adelaide, was wrecked off Cape Grant, October 1850.

CAPTAIN COOK (71), schooner, of Brisbane, foundered off Flinders Gulf, October 1878.

CARIB, whaler, from Tasmania, was wrecked near Nuyt's Archipelago, May 1837. Most of the crew landed safely; one man, named Jackman, was captured by blacks and remained with them till rescued in 1839. See JACKMAN, WILLIAM.

CARLISLE, barque, in 1890 struck on (probably) Crocodile Rock, Bass Strait.

CARLISLE CASTLE (1458), built about 1868 for Green's Blackwall Line, a favourite passenger ship till sold in the nineties, was wrecked 12 July 1899 near Rockingham, on the Western Australian coast, during a heavy gale with thick weather. 11 lives were lost and 15 saved. See also *City of York*.

CARNAQUHEEN, stranded on Tipara Reef, 13 September 1872. The master neglected to ascertain ship's position and to use the lead.

CARNARVON BAY (1932), ship, was wrecked in Bass Strait, 15 September 1910.

CARNATION, schooner, of Sydney, was wrecked in heavy easterly weather, 13 July 1866.

CARN TUAL (497), barque, of Newcastle, has not been heard of since March 1891.

CAROLINE, schooner, was lost at Macleay River, December 1835.

CAROLINE (140), brig, of Sydney, foundered at sea about fifty miles from Sydney, 28 January 1871, while proceeding to Hokianga, New Zealand. One life was lost.

CAROLINE (18), cutter, of Melbourne, foundered in Port Phillip, May 1881.

CARRABEEN, coaster, was lost near Sydney about 1831.

CASSINA (242), barque, of Adelaide, was wrecked at Flinders Island, Bass Strait, August 1870.

CATARAQUI, emigrant ship, from Liverpool to Melbourne, was wrecked at King Island, 4 August 1845. 414 lives were lost, including captain, officers (except first mate) and doctors. On a dark night, on a rocky coast near Cape Wickham in heavy sea, the ship soon broke up. 9 men survived, but only 1 emigrant out of 369.

CATEAUX WATTEL, was burnt and sunk in Sydney Harbour, 4 May 1860.

CATHCART, ship, stranded at Cape Jervis, September 1890.

CATHERINE, schooner, was wrecked at King Island in 1861.

CATHERINE (414), barque, of Melbourne, was wrecked on voyage from Newcastle to Melbourne. She was beached seven miles south of Newcastle in a sinking condition after heavy gale, October 1871.

CATHERINE ADAMSON (886), Aberdeen clipper ship, was wrecked on Inner North Head, Sydney, 24 October 1857. 21 were lost, including the pilot. Having no steerage way, she anchored inside the harbour, but drifted ashore on Inner North Head and sank.

CATHERINE JAMIESON, was scuttled in 1858.

CATHERINE JANE (345), barque, of Melbourne, was wrecked at Cape Upstart, February 1884.

CATTERTHUN (2179), s.s., was wrecked on Seal Rocks during the night of 8 August 1895, with 55 lives lost. She was bound for China from Sydney.

CAWARRA, s.s., was wrecked on Oyster Bank, Newcastle, 12 July 1866, when trying to enter the port during an easterly gale. 60 lives were lost and only 1 saved.

CENTAUR (188), brig, of Melbourne, was wrecked near Fremantle, December 1874. All hands were saved.

CENTENNIAL (591), s.s., sank in Taylor Bay, Sydney Harbour, after a collision off Bradley Head, August 1889.

CENTENNIAL (20), s.s., was wrecked on Long Island, Broughton group, December 1898.

CENTURION (874), ship, of Sydney, was wrecked in 1871.

CENTURION (965), built in 1869. Aberdeen White Star composite clipper ship. When leaving Sydney for Newcastle, 16 January 1887, her tow-line broke; she let go both anchors, but drifted on to North Head and sank in 15 minutes. No lives were lost. Another

vessel in tow got into her way during a heavy squall with rain, and this put her into difficulty.

CENTURION (76), ketch, of Melbourne, was burnt, July 1913.

CERBERUS, H.M.A.S., 70 years old, was towed to Black Rock Beach, Port Phillip, and sunk to form a breakwater in July 1926.

CERES (80), s.s., built in Sydney in 1835, was wrecked on Cabbage Tree Point (Norah Head) near Newcastle, 30 August 1836. Her engines were salvaged and installed in the new s.s. *Victoria* three years later.

CERVANTES, American barque, was wrecked, 29 June 1844, while getting out of Jurien's Bay. The crew walked to Geographe Bay in 7 days, one man dying on the way.

C. FUNK, schooner, was wrecked off Tasmania, 1 August 1898; 11 lives were lost.

CHAMPION, s.s., on voyage from Portland to Melbourne, collided with s.s. *Lady Bird* off Cape Otway, and sank within five minutes, August 1857, 32 lives being lost.

CHAMPION (42), ketch, of Newcastle, sank in collision off Newcastle, June 1879.

CHAMPION, ketch, was wrecked at Cape Hawke, 15 April 1886. She stranded on a sandspit when trying to shift to a more secure berth.

CHAMPION (36), ketch, foundered on the coast of New South Wales, April 1892.

CHANCE, ship, was wrecked in 1845.

CHANCE (41), ketch, of Sydney, capsized on Manning River Bar, 6 June 1874. 3 lives were lost.

CHANCE (20), cutter, of Sydney, was wrecked at Camden Haven, March 1876.

CHANG CHOW, s.s., stranded on Sandy Cape Shoal, 24 October 1884; 6 Chinese were drowned. She was hugging land too close and not making sufficient allowance for current.

CHARLES EATON (313), barque, from Sydney to Singapore, was wrecked on Great Barrier Reef near Sir Charles Hardy Island, August 1834. 5 men in a boat arrived at Timor; 25 of the remaining people were murdered by natives and only 2 boys spared. These were rescued on Murray Island by the *Isabella*, August 1836.

CHARLOTTE, coaster, was wrecked on her maiden voyage from Five Islands to Sydney, 3 November 1825.

CHARLOTTE, coaster, was wrecked near Newcastle, October 1827.

CHARLOTTE, coaster, was wrecked off Newcastle, March 1833.

CHARLOTTE ANDREWS (356), barque, of Sydney, was wrecked at Ramsay Bay, October 1879.

CHARLOTTE PADBURY (640), of Fremantle, built in 1874, was wrecked in 1903.

CHAUDIERE, barque, was lost at Cape Hamelin, 4 July 1883.

CHEETAH (120), schooner, was wrecked near Crowdy Head, 15 February 1868, during heavy SE. gale, all hands being lost.

CHELYDRA (300), barque, of Swansea, was wrecked near Port Stephens during easterly gale, 16 February 1868. One man was drowned.

CHESTERHOLME, ship, was wrecked on Great Detached Reef, near Raine Entrance, in 1858.

CHEVIOT (1226), s.s., of Melbourne, was wrecked at Port Phillip Heads, near Point Nepean, 20 October 1887. 35 were drowned. Her propeller had been lost in bad weather, and her cables parted.

CHILDREN (280), barque, of Launceston, was wrecked on the coast of Victoria in 1859.

CHILLAGOE (1494), s.s., was badly damaged by collision with s.s. *Suva* (2229) off Sydney, 7 December 1925, about 10 p.m. She reached the harbour in a sinking condition and was beached in Parsley Bay. One life was lost from the *Suva*, which also was badly damaged and returned to Sydney.

CHIMBORAZO, s.s., Orient R.M.S., stranded at Point Perpendicular, near Jervis Bay, 15 March 1878, but was afterwards refloated and repaired in Sydney. Her master held in default, with certificate suspended for six months.

CHINDERA (111), s.s., of Sydney, was wrecked on Tweed River Bar, September 1897.

CHIPPEWA, ketch, was wrecked at Crookhaven River Heads, 20 November 1868, with loss of all hands.

CHRISTOPHER GEORGE, schooner, foundered, 23 February 1869, in a SE. gale off Wollongong, with loss of all hands.

C. H. WATJIN (1823), hulk, of Townsville, was condemned at Goode Island, Torres Strait, in 1914. When bound from New York to Yokohama in 1903 she drifted for 11 weeks dismasted and rudderless in the Coral Sea, was towed into Hall Sound, Papua, then towed to Singapore, was converted into a hulk and then towed back again to Thursday Island.

CINCINNATI (460), barque, of Sydney, was wrecked in 1871.

CIRCASSIAN (120), schooner, of Dunedin, was wrecked in thick weather near Ram Head, 6 October 1864. 3 lives were lost, 4 saved.

CIRCE (145), brigantine, was wrecked at Macquarie Harbour, Tasmania, February 1892.

CITIZEN, s.s., of Melbourne, became missing with all hands in October 1862. See Section III.

CITIZEN OF LONDON, schooner, stranded at Bunbury, 20 August 1880.

CITO (235), barque, of Newcastle, was wrecked at Cape Barren Island, Bass Strait, April 1879.

CITY OF ADELAIDE (843), hulk, of Sydney, built in 1864, was broken up in 1915.

CITY OF EDINBORO, was wrecked on the Tasmanian coast, 10 July 1840.

CITY OF FOOCHOW, from Sydney to Calcutta, was wrecked on Flinders Island, Bass Strait, 7 March 1877. All were saved.

CITY OF GRAFTON (555), paddle steamer, of Sydney, was converted into a lighter, March 1920.

CITY OF HOBART (459), s.s., of Sydney. The screw-shaft carried away, water rushed in, and she sank in a few minutes, 60 miles NE. of Wilson's Promontory, 25 July 1877.

CITY OF LAUNCESTON (278), s.s., on voyage from Melbourne to Launceston, collided with s.s. *Penola* in Hobson's Bay, November 1865.

CITY OF MELBOURNE (138), s.s., was wrecked at King Island in 1852, but was salvaged later. All were saved.

CITY OF MELBOURNE (formerly *Black Warrior*), ship, was burnt at Williamstown Pier, Port Phillip, 1 February 1868. She was scuttled, raised three days later, and converted into a hulk in 1877.

CITY OF MELBOURNE (168), barque, of Sydney, was wrecked at Burrum River, September 1873.

CITY OF NEWCASTLE, stranded and lost on Wellington Head, Macquarie Harbour, Tasmania, on 14 November 1872.

CITY OF NEWCASTLE (247), paddle steamer, of Sydney, in a fog struck rocks under Shepherd's Hill, near Newcastle, 12 September 1878. No lives were lost.

CITY OF SINGAPORE (6567), Ellerman and Bucknall s.s., was destroyed by fire at Port Adelaide, 26 April 1924, 3 were killed, 12 injured, chiefly fire brigade men, by explosions.

CITY OF SYDNEY (734), favourite passenger s.s., Melbourne and Sydney, first of the old A.S.N. Co's. s.s., was wrecked at Disaster Bay, near Green Cape, 6 November 1862, during foggy weather. No lives were lost.

CITY OF YORK (1218), ship, of Glasgow, was wrecked on Rottnest Island, 12 July 1899, during heavy gale with thick weather. 11 hands were lost. Ship *Carlisle Castle* was lost during the same night.

CIVILITY, s.s., was in collision with s.s. *Illawarra* on 18 August 1881 off Kiama. *Civility* was to blame for not showing her lights.

CIVILITY (169), s.s., of Sydney, was broken up at Brisbane in 1919.

CLAN RANALD (3596), s.s., of Glasgow, loaded grain and foundered off Troubridge Point in Gulf of St. Vincent, 31 January 1909. 40 lives were lost. She suddenly capsized, but no evidence clearly accounted for it.

CLARA (132), brigantine, of Sydney, was wrecked on rocks outside Newcastle breakwater, 26 July 1874.

CLARA, schooner, was wrecked in collision with s.s. *Macedon* off New South Wales, 3 August 1877.

CLARA, ketch, was wrecked on Gabo Island, 21 September 1886. Her cables had parted, but she should not have been there in that state of weather.

CLARA CRAWFORD (42), schooner, foundered at Normanton, December 1890.

CLARA ETHEL (85), ketch, was wrecked on the Queensland coast, Torres Strait, 16 April 1894.

CLARENCE (223), paddle steamer, of Sydney, ran ashore in fog, and was wrecked, 30 June 1872, on Diamond Head.

CLAYMORE (273), barque, of Adelaide, was wrecked, June 1892.

CLAYTON (16), ketch, was wrecked at Thursday Island, April 1914.

CLEVEDON (1714), ship, of Fremantle, was condemned as unseaworthy, July 1922.

CLIFFORD, was wrecked in Torres Strait in 1842.

CLONMEL (524), s.s., running between Sydney and Melbourne, was wrecked at Corner Inlet, Wilson's Promontory, 3 January 1841. She carried a number of passengers, but no lives were lost.

CLYDE (15), s.s., was burnt at Corner Inlet, Victoria, July 1894.

CLYO (56), barge, was wrecked in the Depuch Archipelago, March 1912.

CLYTIE (19), ketch, of Lyttelton, was wrecked at King Island, May 1902.

COLAC (958), s.s., was wrecked at Derby, September 1910.

COLCHESTER (180), brig, of Melbourne, was wrecked near Port Albert, July 1863.

COLLAROY (402), paddle steamer, was wrecked on Collaroy Beach, 20 January 1881, through negligent navigation. Refloated, September 1884, she was rigged as a schooner, and was wrecked on the coast of California, June 1889.

COLLEEN DHAS (103), schooner, was wrecked on Richmond River Bar, April 1883. The tug had insufficient power to tow her.

COLO, s.s., was wrecked on Tuggerah Beach, 19 October 1906.

COLONIST (109), schooner, sank in collision in Sydney Harbour, March 1890.

COLONIST (1467), s.s., was wrecked on Oyster Bank, Newcastle, 12 September 1894, on top of *Cawarra* wreck. All hands were saved by lifeboat.

COLUMBINE, brig, Liverpool to Melbourne, was wrecked off Barwon Heads, April 1854. The pilot and 3 passengers were drowned.

COMBOYNE (151), s.s., of Sydney, foundered off Bass Point near Port Kembla, 7 September 1912.

COMET, brig, was wrecked south of Boot Reef near the approach to Torres Strait, May 1829. She had left Sydney for Batavia, 12 April 1829. All hands were saved.

COMET, was wrecked off the Queensland coast, east of Bowen, in 1832.

COMET (80), s.s., was built in 1843 and ran on the Parramatta River until 1852, when she was sent to Port Phillip. She left that port in 1862 for New Zealand, crowded with gold diggers, and has not since been heard of.

COMET (87), schooner, was wrecked at Newcastle, in 1886.

COMET (56), s.s., was wrecked at Richmond River, March 1890.

COMET (28), schooner, was wrecked between Bunbury and Fremantle, September 1893.

COMET (30), ketch, was wrecked on Great Barrier Reef, 1893.

COMMISSIONER (11), s.s., was wrecked near Cape Everard, December 1914.

COMMODORE BURNETT, s.s., disappeared in Tasman Sea in 1863.

COMMONWEALTH (94), wooden s.s., foundered off Terrigal, 19 August 1916. All were saved.

COMO, was wrecked on Sow and Pigs Shoal, in Port Jackson, 28 February 1848. The crew were saved.

CONDON (94), s.s., was wrecked at Morna Point, 25 May 1896.

CONDONG, schooner, capsized off Port Stephens, 15 August 1886, in a sudden squall.

CONSIDE (250), s.s., was wrecked off Point Lonsdale, 15 September 1852, with 200 passengers from Sydney, of whom 10 were drowned. The light of a wreck on the reef was mistaken for the lighthouse.

CONSTANCE (10), pearling lugger, was wrecked at Port Smith, near Cape Latouche Treville, north-western Australia, March 1912, during very bad weather.

CONTENT (125), brig, of Melbourne, became missing with all hands in 1877.

CONTEST (322), barque, of Adelaide, was wrecked near Fremantle, June 1874.

COOLANGATTA, schooner, was wrecked near Tweed River, in 1846.

COOLOON (141), s.s., of Sydney, was wrecked at Manning River Heads, February 1917.

COOMA (3839), s.s., of Melbourne, while on voyage from Brisbane to Cairns, stranded on North Reef, Capricorn group, on 7 July 1926. No lives were lost. Salvage operations in progress, August 1926.

COOMBA, ketch, was lost when going to sea from Manning River, August 1877.

COOMBRA (48), paddle steamer, was burnt in 1888.

COQUETTE (41), ketch, was wrecked at Waratah Bay, December 1892.

COQUETTE (214), schooner, of Sydney, was burnt at Townsville, December 1903.

CORAKI (326), s.s., was wrecked on Little Seal Rock, New South Wales, 13 September 1903.

CORAL SEA (16), schooner, of Sydney, was abandoned in 1910.

CORANGAMITE (1562), s.s., of Melbourne, was wrecked at Wreck Bay, 6 December 1886, through the master not reducing speed and hauling off the land when fog came on; his certificate was suspended for six months.

COREA (382), s.s., of Brisbane, was wrecked near Cooktown, 15 August 1893.

CORIO, s.s., of Sydney, left Sydney, 12 July 1866, and was never heard of again; she is supposed to have foundered in heavy weather. 10 lives were lost.

CORRA LYNN (86), s.s., was wrecked in Fly Road, Port Stephens, New South Wales, 17 November 1914.

CORRIDO (220), barque, of Sydney, was wrecked at Swan Island, Banks Strait, north-eastern Tasmania, June 1875.

CORSAIR (111), brigantine, of Melbourne, was wrecked off Merimbula, 13 May 1874, having been beached in a sinking condition.

CORSAIR (51), pilot cutter, was wrecked on Corsair Rock, off Nepean Reef, 23 May 1874. She sailed out from England in 1853.

COUNTESS OF BELMORE (61), schooner, sank in Brisbane River, June 1888.

COUNTESS OF DERBY, ship, was wrecked at Moreton Bay in 1853.

COUNTESS OF MINTO, schooner, was blown from Lady Elliott Island, Queensland, August 1851, with two hands on board.

COURIER, brig, was burnt 23 January 1854, at Cleveland, Queensland.

COWRY (19), s.s., was wrecked at Normanville, June 1889.

CRAIGBURN, ship, stranded near Sorrento, Port Phillip, May 1891.

CREOLE (131), schooner, of Hobart, was wrecked about 1874.

CRESCENT I. (22), ketch, was burnt at Swansea Lake Macquarie, New South Wales, April 1916.

CREST OF THE WAVE, ketch, was lost in Smith's Bay, Kangaroo Island, 30 April 1880.

CRESWELL (464), barque, of Newcastle, was wrecked at Swansea, on the east coast of Tasmania, January 1881.

CROWN (280), barque, of Sydney, was wrecked in 1871.

CULGOA (45), paddle steamer, was wrecked off Noosa, Queensland, May 1893.

CUMBERLAND, was wrecked off Cape Leeuwin, 6 March 1830.

CUPID (12), lugger, was wrecked at Thursday Island, July 1889.

CURLEW (11), schooner, of Fremantle, was wrecked at Onslow, 7 February 1911, during a hurricane. There was 1 survivor.

CURLEW (96), schooner, was wrecked on Nambucca Bar, 16 February 1914, but afterwards refloated.

CURRAJONG (410), s.s., sank through collision with s.s. *Wyreema* in the fairway off Bradley Head, 8 March 1910. One life was lost. She was blown to pieces by divers a few days later.

CYPRUS, convict brig, was captured in August 1829, in Recherche Bay, Tasmania, without bloodshed by convicts aboard, who landed the guard and sailed to China, where they scuttled the vessel.

DAIRY MAID (56), s.s., of Melbourne, foundered, April 1895.

DANCING WAVE (67), schooner, was wrecked between Cairns and Townsville, January 1913.

DANDENONG (575), s.s., of Melbourne, foundered off Jervis Bay, 11 September 1876. In very heavy southerly gale her screw-shaft broke and damaged the after bulkhead, so that she filled with water and sank, drowning 40 people. At Sydney during this gale it is recorded that one of the gusts of wind reached the abnormal velocity of 153 miles per hour.

DANIEL (299), barque, of Sydney, was converted into a hulk in 1920. For many years she was a regular trader to New Zealand.

DAPHNE (95), schooner, was wrecked near Wide Bay, Double Island Point, 16 February 1893.

DAPHNE (44), s.s., was burnt in Sydney Harbour in 1916.

DARCY PRATT (149), brigantine, was wrecked off Queensland, January 1893.

DART, cutter, was wrecked at King Island in 1865.

DART, ketch, was wrecked at King Island in 1876.

DART (132), brig, of Sydney, was wrecked at Port Stephens, March 1876.

DAUNTLESS (22), schooner, foundered off Broken Bay, November 1894.

DAUNTLESS (37), s.s., broke her tail shaft, and was wrecked at Anna Bay, near Port Stephens, 22 March 1921.

DAVID, schooner, of Hobart, was wrecked off Point Lonsdale, April 1850. The chart gave the course as NE. by E. instead of NE. by N. No lives were lost.

DAYSPRING (560), barque, of Sydney, was abandoned and foundered 70 miles east of Newcastle, on the coast of New South Wales, March 1871. The crew were saved by s.s. *Wonga Wonga*.

DEFIANCE (31), schooner, was lost in Bass Strait in 1833.

DEFIANCE (136), schooner, of Sydney, was wrecked in 1873.

DELIGHT, coasting cutter, was wrecked at Newcastle, 12 April 1838.

DENMARK HILL, was lost in Broken Bay, 25 April 1839.

DENTON HOLME, barque, stranded off Rottnest, September 1890.

DEODARUS (303), barque, of Brisbane, was wrecked

on Great Barrier Reef, 25 June 1887. Inquiry was held at Cairns.

DERRY CASTLE, ship, stranded and was wrecked on Enderby Island, off Auckland Island, south of New Zealand, 20 March 1887. 16 were lost, including the master and all mates.

DERWENT HUNTER (368), barque, of Hobart, was burnt in Hobart, December 1907.

DESPATCH (237), s.s., Huddart Parker, was wrecked at Cunninghame, Gippsland Lakes Entrance, 28 September 1911. She struck the pier and sank. All were saved, though with difficulty in strong tide.

DEVA (244), brig, of Newcastle, was abandoned at Smoky Cape, 30 November 1870.

DEVERON, was wrecked at Moreton Bay, 19 June 1833.

DEVON (130), s.s., was wrecked at Macquarie Head, Tasmania, September 1894.

DIAMANTINA (239), paddle steamer, of Sydney, was wrecked at Manning River, March 1881.

DIANA (161), brig, of Hobart, was wrecked at Belfast, October 1844.

DICKIE (31), schooner, of Fremantle, was wrecked, August 1912.

DISPATCH, ship, Sydney to London with wool, was burnt in 33½° S., 161¾° E., off Australian coast, in 1839. Found to be on fire, she was destroyed within 24 hours. One boat with crew was picked up by *Governor Bourke* 4 days later and brought to Sydney. Another boat, with 21 people, was missing.

DOLLAR BIRD, schooner, was wrecked on Tweed River Bar, 26 November 1884, while being towed in under charge of pilot.

DOLLY WALMSLEY (39), ketch, was wrecked at Stoney Point, Newcastle, May 1894.

DOLPHIN, convict hulk, was wrecked in 1829.

DOMAIN, cutter, was wrecked, 11 April 1846, on Wilson's Promontory. 14 lives were lost.

DOMINION (1217), hulk, of Sydney, was burnt, November 1921.

DONAH, was wrecked at King Island, Bass Strait.

DON JUAN, schooner, foundered in SE. gale off Newcastle with loss of 6 lives, 9 May 1869.

DON NICHOLAS, Nicaraguan ship, foundered off the coast of New South Wales. The crew arrived safely at Sydney in boats, 1891.

DORIS (12), pearling lugger, of Fremantle, was wrecked at Broome, 19 November 1910, during a hurricane.

DOROTHY (12), s.s., was left derelict on Lake Colac in 1916.

DORRIGO (715), s.s., left Brisbane for Thursday Island and foundered a few hours later in rather heavy SE. sea off Double Island Point, 5 April 1926; 2 lives were saved on a raft; 22 were lost.

DORSET (7000), s.s., arrived at Fremantle from New York and while she was discharging cargo fire broke out, October 1904, doing great damage to cargo in one hold.

DOTTERELL, was lost off Port Dalrymple, March 1827.

DOUGLAS MAWSON (167), s.s., foundered with loss of all lives in a cyclone in the Gulf of Carpentaria while on voyage from Burketown to Thursday Island, 28 March 1923.

DOVE, was lost at Port Stephens, New South Wales, 5 June 1828. 7 lives were lost.

DOVE (42), s.s., was wrecked at Port Douglas, March 1911.

DRUID, was wrecked in Torres Strait in 1854.

DUCKENFIELD (251), s.s., foundered off Sydney Heads, May 1889. No lives were lost.

DUCO (130), s.s., of Wellington, was reported missing in 1910.

DUGONG (177), s.s., was wrecked at Wide Bay, September 1914.

DUKE OF CORNWALL (115), ketch, of Newcastle, was wrecked off Mackay, February 1887.

DUKE OF YORK, ship, was wrecked on reef 8 miles from Facing Island, Queensland, on 13 August 1837. All hands except 2 reached Brisbane in boats.

DUNBAR (1321), ship, was wrecked at South Head, Sydney, 20 August 1857, with 121 lives lost. See article DUNBAR, WRECK OF THE.

DUNSKEY (34), s.s., was wrecked at Noralup Inlet, south-western Australia, March 1917.

DURISDEER, barque, was wrecked on Stockton Beach, Newcastle, 22 December 1895.

DUROBY (119), s.s., of Sydney, was damaged by fire in Sydney Harbour, March 1923, and condemned, August 1923.

DUSTY MILLER, from Hobart to Port Phillip, was wrecked in Portland Bay, December 1842, with one drowned.

EAGLE (125), schooner, was wrecked on North Head, Port Jackson, 30 July 1866, through missing stays.

EAGLETON, schooner, of Sydney, foundered in Anna Bay near Port Stephens, 9 May 1869, with loss of all hands, in SE. gale.

EARL OF CHARLEMONT (870), ship, sometimes wrongly called *Earl of Cumberland*, was wrecked on Charlemont Reef near Barwon Heads, having hove to during the night while awaiting daylight to enter Port Phillip, 18 June 1853. 435 passengers were aboard, but no lives were lost.

EARL OF DUNMORE (2287), 4-masted barque from London, badly damaged by fire in Rose Bay, Sydney, where she was beached and pumped full of water, 14 August 1903. She was refloated later.

EARL OF HOPETOUN (23), cutter, was wrecked at King Island, November 1902.

EARL OF LINLITHGOW, ketch, was wrecked at King Island in 1904.

EARL OF WINDSOR (670), ship, from Otago, was wrecked in Corner Inlet, 12 October 1873. No lives were lost.

EASBY (969), s.s., was wrecked on Gabo Island, 6 April 1907. She struck Skerries Reef, was badly damaged, and was beached in Gabo Harbour. No lives were lost.

ECHO (70), schooner, was lost at Hobart, September 1840.

ECHO, ship, ran aground near Port Phillip Entrance in 1855.

ECHO (55), ketch, was wrecked at Nelson Bay, Port Stephens, 21 September 1894, with no loss of life.

ECLIPSE, brig, was lost on Richmond River Bar, 8 January 1854.

ECLIPSE, schooner, was lost off Manning River, 12 July 1866, with 8 lives.

ECLIPTIC (314), barque, of Melbourne, was wrecked near Port Albert, on a voyage from Newcastle to Melbourne, March 1874. All hands but one were drowned.

EDDYSTONE (1313), s.s., of Melbourne, was wrecked at Depuch Island, 11 September 1894.

EDEN (693), s.s., struck Point Perpendicular while proceeding from South Coast to Sydney, December 1909. She was greatly damaged.

EDEN HOLME (794), of London, built in 1875 and chiefly used for Tasmanian wool and passenger trade, was wrecked on Hebe Reef near Port Dalrymple, 8 January 1907.

EDINA (266), s.s., in June 1869 stranded off Gellibrand lightship in hazy weather.

EDINBURGH, was burnt off coast of New South Wales, March 1836, while on voyage from Sydney to Liverpool.

EDITH (60), schooner, was wrecked near Condon Creek, April 1907.

EDITH CARMICHAEL, barque, was wrecked on Eastern Fields Reef, near north-eastern entrance to Torres Strait, 20 August 1884, either through an error in her chronometer or because of a SE. current.

EDITH HAVILAND (264), brig, of Melbourne, Adelaide to Sydney, was wrecked on Carpenter Rocks, near Cape Banks, 20 June 1877. 4 lives were lost.

EDITH KEEP (100), brigantine, of Sydney, became missing with all hands, May 1880.

EDWARD, schooner, was wrecked at Port Stephens, August 1839.

EDWARD, cutter, left Newcastle for Sydney, 30 June 1865, and was never heard of again. 4 lives were lost.

EDWARD, brig, was wrecked at Point Nepean, 30 September 1912.

EDWARD LOMBE, ship, from London via Hobart, was wrecked on Middle Head, while entering Sydney Harbour, 25 August 1834. 12 were lost including the captain, second and third mates, the ship being dashed to pieces. 17 were saved.

EFFOET, schooner, was lost on Tuggerah beach in 1854.

ELEANOR (396), barque, of Newcastle, is supposed to have foundered with 12 hands between Sydney and New Zealand about 26 July 1874.

ELEANORA, schooner, was burnt and sold in Sydney in 1853.

ELEANOR JOHNSTONE, schooner, was wrecked on Gabo Island, 9 December 1882.

ELEANOR LANCASTER, barque, was wrecked near Oyster Bank, Newcastle, 6 November 1856. The crew were saved through the gallantry of the crew of the *Lord Burleigh* in heavy gale.

ELECTRA (210), s.s., of Sydney, was converted into a lighter in 1920.

ELEMANG, many years an interstate s.s., was filled with cement and sunk, together with old s.s. *Katoomba*, on Oyster Bank, Newcastle, to form extension of northern breakwater, February 1905.

ELIZA (57), ketch, foundered off Bellinger River, October 1888.

ELIZA ALLAN, schooner, stranded near Ballina, Richmond River, March 1891.

ELIZA ANN, stranded on Port Phillip Heads in 1856.

ELIZABETH, brig, was lost between Sydney and Newcastle in 1830.

ELIZABETH, brig, was wrecked off northern Australia in 1831.

ELIZABETH (200), brig, of Melbourne, was wrecked at Cape Schanck in 1848.

ELIZABETH, barque, was wrecked on Great Barrier Reef, Queensland coast, 28 June 1854.

ELIZABETH, ketch, was wrecked at King Island in 1855.

ELIZABETH, schooner, capsized and foundered in a squall off Bulli, New South Wales, with loss of all hands, 24 November 1868.

ELIZABETH MARY (250), barque, of Sydney, was wrecked on Great Barrier Reef, Queensland, October 1887.

ELIZABETH SELDON (100), schooner, of Sydney, became missing about 1888.

ELIZA RAMSDEN (395), barque, of Melbourne, from Melbourne to Newcastle, was wrecked on Nepean Reef, July 1875. No lives were lost.

ELLA GLADSTONE (225), brig, of Adelaide, was wrecked at Quindalup near Busselton, July 1878.

ELLEN, schooner, was wrecked at Tathra, February 1878.

ELLEN (499), barque, foundered in SE. gale off Seal Rocks, 11 June 1891. Only one man was saved.

ELLEN A. READ, ship, was badly damaged by fire, 3 May 1896, in Double Bay, Sydney.

ELLENGOWAN (36), s.s., foundered near Darwin, April 1888.

ELLENGROVE, barque, was lost on the coast, 8 September 1876.

ELLEN SIMPSON (310), barque, of Melbourne, was wrecked at Cape Howe, 28 May 1866, in heavy gale. 9 lives were lost and 2 saved.

ELLERSLIE (147), s.s., was wrecked at Bellinger River, 22 May 1913.

ELLERTON (87), schooner, was wrecked in Flinders Passage, Great Barrier Reef, 21 March 1893.

ELLESMERE (179), brig, of Sydney, was wrecked while leaving Richmond River, 26 March 1873.

ELLISTON (159), schooner, was wrecked near Bellinger River, 19 February 1904.

ELMGROVE (255), barque, of Sydney, from Newcastle to Adelaide, was wrecked at Five Mile Beach, 8 September 1876, with loss of 8 hands.

ELOISE (33), schooner, was wrecked in York Sound, June 1892.

ELSIE, schooner, was wrecked at Kingston, Lacepede Bay, 11 June 1878.

EMEL JULIUS. was badly damaged by fire, 2 August 1884, at Miller's Point, Sydney.

EMILY AND MARY (23), ketch, foundered off Newcastle, January 1892.

EMILY ANN (39), ketch, stranded on Mermaid Reef, near Port Macquarie, 24 August 1883. Refloated, she was wrecked at North Head, Sydney, January 1889.

EMILY HOST, schooner, when leaving Sydney for Rockhampton, was lost on North Head, 13 October 1861.

EMILY MILLER, ketch, was driven ashore near Wasp Inlet, by heavy swell during calm, 8 December 1879. She should have anchored as the water shoaled.

EMILY SMITH, brig, of Adelaide, became a total loss in Maupertius Bay, Kangaroo Island, 15 May 1877. All hands (21) were lost.

EMMA (139), brig, of Sydney, became missing about 1888.

EMMA MATILDA, was wrecked on North Head, Sydney, 2 January 1895. The master was drowned.

EMMANUEL (64), ketch, foundered off Botany, December 1890.

EMPEROR (284), brig, was wrecked on North Head, Port Stephens, 30 March 1886. Insufficient sail for tacking had been set.

EMPIRE (55), schooner, was wrecked in Port Phillip, February 1894.

EMPRESS OF INDIA, schooner, was wrecked near Cape Hawke, 23 July, 1900, during south gale. 3 hands were lost.

EMPRESS OF THE SEAS (1647), (the first), built in 1853, wooden clipper ship of White Star Line. On her second voyage from Melbourne to London she was burnt at Queenscliffe, 19 December 1861, the day after leaving, and was scuttled and sunk off Point Nepean. Her gold was saved, but the cargo of wool and tallow were entirely destroyed.

EMU (131), s.s., was wrecked at Crowdy Bay, October 1888. The master was drowned.

ENCHANTRESS, emigrant ship, was wrecked at night while working up D'Entrecasteaux Channel to Hobart, 17 July 1835. Her jib-boom was broken against cliffs of Bruni Island, and she sank in deep water, with loss of some 50 lives, only about 3 being saved.

ENCOUNTER, H.M.S., pinnace of, was sunk in Port Jackson off Mrs. Macquarie's Chair by collier *Dunmore*, while proceeding out of Woolloomooloo Bay with sixty-seven bluejackets, 15 of whom were drowned, 5 January 1909.

ENDEAVOUR, cutter, was burnt in Port Stephens, 25 July 1852.

ENDEAVOUR (78), s.s., was wrecked at Brunswick River, February 1892.

ENDEAVOUR, small oil s.s., blew up, on fire, off Samarai, New Guinea, 12 July 1912. The engineer was killed.

ENDEAVOUR (102), s.s., of Melbourne, became missing, December 1914.

ENDEAVOUR (12), schooner, foundered at Barrimgarra Creek, 14 March 1917, during a hurricane.

ENDEAVOUR: several dozen small cutters and schooners of this name of less than 100 tons have been wrecked, and are omitted from this list. A large number of them, of from 10 to 20 tons, were pearling luggers (q.v.).

ENERGY (185), brigantine, of Auckland, was wrecked near Clarence Heads, 29 March 1887. She missed stays and dragged her anchor.

ENERGY, tug, sank in collision with s.s. *Electra* off North Head, Sydney, 31 May 1906. 2 lives were lost.

ENERGY, tug. See *Young Bungaree*.

ENGLEBERT (245), schooner, of Adelaide, was wrecked in Rivoli Bay, on 24 August, 1881.

ENGLAND, ship, struck on Harrington Shoal, near Albany Pass, April 1874.

ENNERDALE, s.s., struck a rock in Bass Strait, near Beagle Rock, in 1909.

E. NORRIS, American ship, was burnt in Hobson's Bay, Melbourne, 24 February 1859.

ENTERPRISE (61), barge, foundered at Althorpe Island in 1889.

ENTERPRISE (58), schooner, was wrecked at Forth River, July 1892.

ENTERPRISE (83), schooner, was wrecked at Depuch Island, March 1912.

ERIC THE RED, brig of U.S.A., during voyage towards Melbourne was wrecked on Cape Otway, 4 September 1880. 4 lives were lost.

ERINA, s.s., was burnt in White Bay, Sydney, 5 July 1911.

ERNIE (8), lugger, was wrecked at Raffles Bay, December 1915.

ESCORT (130), schooner, was wrecked near Townsville, November 1894.

ESK (547), s.s., was lost on Hebe Reef, Tamar River, 24 April 1886, owing to navigation without consulting charts.

ESMERALDA, ship, from London, blown close ashore, and with all sails lost, was unable to get off the land, and ran into Esmeralda Cove, Broughton Island, where she was beached snugly and towed off a week or two later without much damage; in 1877.

ESPERANZA, brig, foundered during heavy SE. gale off Bird Island, New South Wales, 16 February 1868, with 10 drowned.

ESSIE BLACK (281), barque, of Sydney, was wrecked in Kent group, Bass Strait, January 1876.

ESSINGTON (123), brig, was wrecked at Belfast, 4 May 1852.

EULIE, London, stranded by strong current on rocks off Rottnest Island, June 1877.

EURIMBLA and WAKATIPU, collided, 15 February 1903, off Bradley Head, Sydney. s.s. *Eurimbla* (1055), was badly damaged, but returned to her wharf. s.s. *Wakatipu* (1945) was beached in Neutral Bay and refloated a few days later.

EURO (284), s.s., of Adelaide, stranded on Ward Spit, Spencer Gulf, 29 May 1880.

EUROKA (51), schooner, of Sydney, was wrecked with all hands lost, off Sandon River, March 1875.

EUROKA (170), paddle s.s., was wrecked on Long Reef, Manly, 19 October 1913. Abandoned, she drifted on to the reef.

EUROPA (190), brig, on a voyage from Newcastle to Adelaide was wrecked on Sea Elephant Rock, off King Island, on account of heavy gale and thick weather, November 1867. No lives were lost.

EUEUS, barque, while at anchor in Moreton Bay, 18 August 1884, was run into by s.s. *Tinonee*.

EVELINE MARY (18), cutter, was wrecked at Abrolhos Island, April 1891.

EVELYN (61), ketch, was wrecked at Frazer Island, February 1890.

EVERGREEN (17), ketch, of Sydney, was wrecked in 1914.

EVERTON (904), ship, from England, was wrecked on Moreton Island, 19 March 1863.

EVERTON GRANGE, s.s., stranded on Kangaroo Island, 12 January 1911.

EXAMINER, s.s., was wrecked at Clarence Heads, 7 May 1872.

EXCELSIOR (273), barque, was wrecked on Bellambi Reef in 1859.

EXCELSIOR (399), hulk, of Sydney, was wrecked in Outer Harbour, Port Adelaide, April 1910.

EXCHANGE (12), pearling lugger, was wrecked at Broome, November 1910, during a hurricane.

EXPERIMENT, schooner, was wrecked on Northern Coast, New South Wales, January 1836.

EXPERIMENT (37), s.s., foundered at wharf at Brisbane during bad weather in 1848. She was raised and dismantled.

EXPERIMENT, schooner, foundered at sea, 7 May 1881. Inquiry was held at Adelaide, 16 May, and the master (drowned) was blamed for carrying too much sail, so that she capsized in a squall.

EXPRESS, schooner, was wrecked in 1844.

FAILFORD (73), schooner, was wrecked at North Head, Sydney, May 1899.

FAIRFIELD (534), ship, of Adelaide, was wrecked on Kangaroo Island, August 1872.

FAIRY, Port Macquarie to Sydney, was lost, June 1834.

FAIRY, coaster, was wrecked at Macleay River, May 1839.

FALCON (195), brigantine, of Sydney, was wrecked on North Head, Sydney, 15 June 1886. She missed stays, and her cable parted when the anchor was let go.

FALLS OF HALLADALE, 4-masted barque, was wrecked in Curdie's Inlet, November 1908, being firmly wedged on rocks with all sails set. No lives were lost.

FAME, barque, was lost on Sow and Pigs Shoal, Port Jackson, 2 August 1857.

FANNY, schooner, was lost at Swan River, 1838.

FANNY (164), brigantine, was wrecked at Port Stephens, 17 April 1885. Her cables parted during a gale.

FANNY CAMPBELL (151), brigantine, of Sydney, was wrecked in 1872.

FANNY NICHOLSON (285), barque, of Sydney, was wrecked in King George's Sound, December 1872. Her owners were negligent in sending her to sea with defective cables.

FANNY WRIGHT (107), schooner, of Adelaide, was wrecked at Waterloo Bay, August 1877.

FARNINGHAM (281), barque, of Adelaide, sank in collision with barque *Vanguard* off Tasmania, 11 July 1884. 3 of the crew were drowned, and *Vanguard* was blamed.

FARWAY (195), Maryborough to Sydney, was wrecked on a reef near Lady Elliott Island, 9 February 1864. 3 of the crew were lost, 6 saved.

FATIMA, ship, was wrecked in Torres Strait, 26 June 1854.

FAUGH-A-BALLAGH (300), barque, of Sydney, was wrecked in Port Phillip, August 1852.

FAVOR, schooner, was wrecked at King Island in 1864.

FAVOR, schooner, was wrecked at King Island, 12 October 1880.

FAVORITE (96), schooner, left Melbourne, 9 May 1852, for Sydney and never arrived. All hands were lost, 8 of crew and 13 passengers. She was last seen making bad weather to SW. off Cape Howe, and soon afterwards a heavy SE. gale set in.

FAVOURITE (50), ketch, of Sydney, was wrecked at Cape Hawke, May 1897.

FEARLESS, schooner, stranded on Hannibal Island, 16 October 1884.

FEDERAL (1540), s.s., of Melbourne, foundered in Bass Strait, 21 March 1901. Several lives were lost.

FEDERAL (92), schooner, was burnt in Turtle group in 1914.

FENSTANTON, s.s., stranded on Saddle Island, Queensland, 30 September 1884, in consequence of a strong NW. current.

FERGUSON, ship, was wrecked in 1840 on Great Barrier Reef, near Quoin Entrance, in latitude 12° 24′ S. She was thrown so high on the reef that she was a conspicuous mark for many years afterwards.

FERNMOUNT, s.s., was wrecked at Bellinger River, January 1891.

FERRET (460), s.s., was stolen at Glasgow and arrived at Melbourne, where the principals were arrested, tried for theft, 29 July 1881, and were each sentenced to several years' imprisonment. It was then sold to an Adelaide firm, and was wrecked on Yorke Peninsula, South Australia, November 1920.

FIDES, was lost in 1859.

FIDO (484), barque, of Triedstona, left Newcastle in May 1898 for Auckland, and was not heard of again. 12 lives were lost.

FIDO, Norwegian s.s. from Nauru or Pleasant Island for Sydney, was wrecked on Tweed Heads, 19 July 1907. No lives were lost.

FIFESHIRE, s.s., stranded and was wrecked near Cape Three Points, June 1886. Insufficient precautions had been taken when fog came on.

FIJI, barque, was wrecked at Gellibrand River, September 1891.

FIONA (439), s.s., Sydney, was wrecked on Seal Rocks, January 1882.

FIREFLY, brig, stranded in 1860 on Sir Charles Hardy Island, while going to Gulf of Carpentaria to form on Albert River a depot for search party for Burke and Wills. She was refloated.

FIRE KING (172), paddle steamer, of Sydney, was wrecked at Manning River, 30 April 1873. No lives were lost.

FITZROY (504), A.U.S.N. Co. s.s., was wrecked off Morna Point, 11 December 1897.

FITZROY (342), s.s., foundered off Cape Hawke in heavy SE. gale, 26 June 1921. 31 lives were lost, with one survivor.

FIVE ISLES, s.s., stranded on Henry Head, Port Stephens, July 1916.

FLEETWING (33), schooner, of Rockhampton, was wrecked on the coast of Queensland in 1889.

FLEUR DE MAURICE (317), barque, of Adelaide, stranded in Challenger Passage, 30 June 1887. She was wrecked at Port Natal, April. 1894.

FLINTSHIRE, s.s., was wrecked off Cape Cleveland, 22 June 1874.

FLIRT, schooner, was lost in Seal Rock Bay, New South Wales, in July 1876. All hands were saved.

FLIRT (100), schooner, sank in Brisbane River and was broken up, March 1889.

FLORA, ship, Sydney to Batavia, was lost on Great Barrier Reefs, off Cape Grenville, while making Torres Strait, 1 May 1832. In thick squally weather she could not find an opening in the reefs, tried to beat off, and was forced ashore in the evening among tremendous breakers.

FLORA (114), schooner, sank in Brisbane River during a great flood. She had been a Queensland labour vessel for years, was condemned in 1887, moored off Brisbane, and broken up, March 1889.

FLORA (12), pearling lugger, was wrecked at Broome, November 1910, during a hurricane.

FLORA BELLA, schooner, was wrecked near Ben Buckler, near Port Jackson, 20 January 1857.

FLORENCE, schooner, stranded in Montagu River, Tasmania, 4 October 1883, through failing to answer her helm.

FLORENCE IRVINE (920), s.s., from Brisbane to Sydney, was wrecked on rocks near Port Stephens, 4 December 1877. One life was lost. The master was to blame for not using the lead when close in to land during foggy weather.

FLORIDA (216), schooner, of Sydney, was wrecked at Browne Island, Torres Strait, September 1887.

FLORINDA (106), schooner, of Maryborough, was wrecked at Cockburn Island, June 1887.

FLORRIE ELLISON (28), s.s., was wrecked at Manning River Heads, May 1902.

FLY, cutter, was lost at Port Macquarie in 1845.

FLY, H.M. sloop, was wrecked outside Sydney Heads, June 1829, with 3 drowned, 2 saved.

FLYING ARROW, American ship, became dismasted in Bass Strait, November 1855, and was towed into Melbourne, where she was sold and renamed *Wings of the Wind*.

FLYING CLOUD (235), brig, of Newcastle, was wrecked at Port Macdonnell, April 1870.

FLYING CLOUD, ketch, of Sydney, was wrecked on Great Barrier Reef, July 1874.

FLYING SCOTCHMAN (10), pearling lugger of Darwin, was wrecked at Junction Bay, March 1912, during very bad weather.

FLYING SQUIRREL (79), brigantine, of Melbourne, was wrecked at King Island, August 1875. No lives were lost.

FOREST QUEEN (51), ketch, was wrecked at Charlotte Head, March 1894.

FORMOSA (173), s.s., under canvas as a three-masted schooner, while on voyage from Greenock to Melbourne, was wrecked off Point Nepean through running too close to Port Phillip Heads on a dead lee shore, the vessel being unmanageable and badly equipped, 8 February 1869.

FORMOSA (54), ketch, was wrecked on the outside of North Head, Port Jackson, February 1891.

FRANCIS BARCLAY, barque, was lost in 1853.

FRANCIS, cutter, was wrecked off South Australia in 1840.

FRANCIS (102), schooner, of Sydney, was wrecked in 1861.

FRANCIS FREELING, was lost at Port Stephens, June 1829.

FRANCIS GEORGE, schooner, became missing with all hands. She is supposed to have foundered, 6 May 1870, during heavy SE. gale near Brunswick River.

FRANCIS HIXSON, s.s., was lost at Richmond River Heads, 17 January 1883.

FRANKLIN (395), s.s., of Adelaide, was wrecked in 1902.

FRANZ (148), schooner, was wrecked near Shellharbour in easterly gale, September 1879.

FRAY BENTOS (511), barque, of Adelaide, was broken up at Adelaide in 1899.

FREAK, brig, in 1848 struck a reef off Booby Island, Torres Strait, through rounding too closely, but was repaired and continued in service until wrecked on Great Barrier Reef near Providential Channel, in December 1870. 12 South Sea islanders were drowned.

FREAK, schooner, was wrecked at Port Stephens, 7 October 1864. All were saved.

FREDERICA, barque, stranded and was lost on Vansittart Shoal, Furneaux group, Bass Strait, 24 December 1883.

FREDERICK, coaster, was wrecked near Newcastle, June 1831.

FREDERICK, was wrecked at Newcastle in 1854.

FREDERICK DAVIS (42), s.s., foundered near Bare Bluff, near Clarence River, 25 December 1908. Seams opened up and she foundered while on voyage from Ballina to Melbourne.

FREEBRIDGE, schooner, was wrecked in Waterloo Bay, Wilson's Promontory, 19 May 1877. Her cables parted in bad weather.

FREE TRADER (188), barque, was wrecked at Warrnambool, August 1894.

FRIENDS, schooner, of Melbourne, was wrecked in heavy easterly weather, 13 July 1866.

FRIENDSHIP, schooner, was lost at Twofold Bay in 1835.

FRIENDSHIP (143), s.s., was wrecked at Tweed River, 2 June 1912. Refloated, she was afterwards totally wrecked at Tweed River, 28 November 1912.

FRISK, brig, from Liverpool, was wrecked on Point Nepean, 27 May 1853, while trying to enter Port Phillip without a pilot. 4 lives were lost.

FROWNING BEAUTY (365), barque, of Newcastle, was wrecked in Hobson's Bay, Port Phillip, June 1876, owing to deficient ground tackle.

FURY (378), barque, in August 1869, on a voyage from Newcastle to Melbourne, grounded off Rabbit Island, owing to negligence of uncertificated master.

F. W. TUCKER (174), brigantine, of Melbourne, was wrecked at Clarence River, July 1878.

GAEL, French barque, was lost off Tasmania in 1909.

GALATEA (167), brigantine, of Melbourne, was wrecked at Port Macdonnell, March 1876.

GALATEA, yacht, was sunk at her moorings in Neutral Bay, Sydney, by s.s. *Pacific*, 12 April 1884.

GALATEA, ketch, was wrecked on Cronulla Beach, January 1908.

GAMBIER (1030), s.s., with passengers from Sydney, foundered after collision in Port Phillip, August 1891. 21 lives were lost.

GARFIELD, schooner, was wrecked at King Island in 1897.

GARTHSNAID (1416), barque, became dismasted off Green Cape and was towed into Port Jackson, where she was condemned and converted into a coal hulk, April 1923.

GAZELLE, schooner, was lost in Trial Bay, 2 June 1864.

GAZELLE (47), s.s., was wrecked at Apollo Bay, February 1888.

GEELONG (239), s.s., was wrecked near Carlisle Island, February 1888.

GEFFRARD (316), brig, of Melbourne, was wrecked in 1875.

GELTWOED. See *Giltwood*.

GEM (52), cutter, was lost off Fremantle with all (10) hands on 13 June 1876.

GEM, hulk, sank off Barranjuey, 27 September 1895. 2 men were lost.

GEM (99), schooner, sank in Sydney Harbour, August 1919. Her register was cancelled.

GENERAL GORDON (60), schooner, of Sydney, foundered at sea off Western Australia, June 1889.

GENERAL PICTON, barque, stranded off Foster Island, 24 July 1888.

GENERAL WOOD (171), barque, of Sydney, left Sydney, 15 February 1868, and was never heard of again. She is supposed to have been lost near Cape Hawke with all hands.

GEORGE GORDON, ship, stranded on Eastern Fields Reefs, near entrance to Torres Strait, 11 September 1884. Stranding due to a southerly set out from Gulf of Papua.

GEORGE ROPER, ship, was wrecked at the entrance to Port Phillip, 4 July 1883, through negligence of pilot.

GEORGE III., convict ship, was lost on rock in D'Entrecasteaux Channel, 12 April 1835, while proceeding to Hobart from London; 134 convicts and crew were lost, 161 saved. She struck a rock at the southern entrance to the channel and beat violently on it, so that very soon she was a complete wreck. The survivors were saved by boat and the schooner *Louisa*.

GEORGE THORNTON (182), schooner, of Sydney, was wrecked near Keppel Bay, December 1887.

GEORGETTE (332), s.s., of Fremantle, was wrecked north of Cape Leeuwin, December 1876, through negligence and error of judgment.

GEORGIANA (500), ship, anchored in Port Phillip, 16 October 1852, with 300 immigrants. The crew then mutinied, attacked the officers, landed in boats, and went to the gold diggings. One hand was killed.

GEORGINA (315), barque, of Melbourne, became missing, July 1880, with all hands.

GEORGINA GODFREY (15), schooner, of Sydney, became missing with all hands, February 1891.

GERTRUDE (12), lugger, was wrecked at Wednesday Island, Torres Strait, September 1911.

G. H. PEAKE (271), brig, of Melbourne, sank in a collision with the American *Sierra Nevada* at Newcastle, 11 July 1874. All hands were saved.

GIBSON, ship, in 1853 struck on a shoal in Endeavour Strait (Torres Strait).

GILBERT JAMIESON, schooner, was lost at Nobby's, Newcastle, in 1859.

GIL BLAS, ship, was pooped while entering Port Phillip by a heavy sea, which washed overboard her captain and 3 of her crew, 1859.

GILTWOOD (or *Geltwoed*, 1056), barque, from Liverpool to Melbourne was found wrecked near Rivoli Bay, July 1876, without survivors (27 lives lost).

GIPSY, s.s., was lost at Manning River Heads, 24 April 1856.

GITANA (113), schooner, of Sydney, was wrecked in 1872.

GLAMES, barque, stranded at Kingstone, Lacepede Bay, May 1891.

GLANEUSE (482), French barque, was wrecked at Port Phillip Heads in 1886. Brandy carried in her cargo was dug out of the sand.

GLANWORTH (558), s.s., was wrecked on Facing Island, near Settlement Point, on 25 January 1896.

GLEANER (14), ketch, was wrecked on Freycinet Peninsula, July 1891.

GLENBANK, schooner, was wrecked during hurricane off Legendre Island, 6 February 1911. 23 of the crew were lost, one saved.

GLENELG (210), s.s., of Sydney, was wrecked on the Victorian coast, 25 February 1900. 31 lives were lost.

GLENGARRY, schooner, was wrecked on Ninety Mile Beach, 31 May 1882, through heavy weather.

GLIMPSE (335), barque, of Auckland, was justifiably abandoned at sea, and foundered on the coast of New South Wales, October 1881.

GLOSSARIEL, schooner, was abandoned off Camden Haven, 27 February 1886. No effort was made to free her from water when she began to leak.

GLOUCESTER (526), barque, of London, was abandoned and foundered, having sprung a leak, 29 July 1877, 30 miles off Smoky Cape.

GNEEKING (48), paddle steamer, was wrecked at Maroochie River, near Moreton Bay, September 1893.

GODDEFROY, s.s., was wrecked at Newcastle, 28 September 1880. 7 lives were lost.

GOLD (312), schooner, foundered off Flinders Island, Bass Strait, 4 April 1887, having sprung a leak in a gale.

GOLDEN AGE (381), barque, of Melbourne, on voyage from Newcastle to Melbourne, July 1871, was wrecked on Vansittart Shoal in consequence of the shoal having extended and not been accurately charted.

GOLDEN SOUTH, wooden clipper ship, converted into a hulk, while lying in Kerosene Bay, Sydney, 29 May 1893, caught fire, with the old reformatory ship *Vernon* alongside. Both ships were destroyed.

GOOD INTENT, ketch, foundered at Darwin, November 1892.

GOOD LUCK (100), schooner, of Fremantle, foundered at sea, October 1880.

GOSFORD PACKET, screw ketch, was lost on the coast near Sydney, 28 June 1881.

GOTHENBERG (501), passenger s.s., of Melbourne, from Darwin for Adelaide, was wrecked on Great Barrier Reef, near Flinders Passage, 24 February 1875, 102 lives being lost, 27 saved.

GOVERNOR ARTHUR, was lost off Nobby's, Newcastle, 25 April 1829.

GOVERNOR BLACKALL (487), s.s., built at Balmain in 1871, favourite A.S.N. Co. passenger vessel to Queensland until 1885 (when she became used as a collier), was converted into a coal hulk in Darling Harbour, Sydney, about 1905.

GOVERNOR BOURKE, was lost outside Sydney in 1837.

GOVERNOR MACQUARIE (106), colonial brig, was lost in Bass Strait while bound from Hobart to Sydney, 12 December 1829.

GOVERNOR PHILLIP, convict ship, was wrecked, 27 October 1848, on a sandbank off Cape Barren Island, Bass Strait. Nearly all the convicts were saved through the calm bravery of Lieutenant Griffiths, who was in charge of them, and who perished while trying to save the last 4 convicts when the ship sank.

GOVERNOR READY (512), ship, was wrecked in Torres Strait between Murray and Halfway islands, May 1829, having left Sydney on 18 March for Batavia. The crew took to 3 boats and reached Timor after 14 days' passage, having sailed 1500 miles with no loss of life.

GOVERNOR WELD (18), cutter, was wrecked on Casuarina Reef, West Australia, February 1894.

GRACE DARLING (69), schooner, was wrecked at Maroochie River, near Moreton Bay, September 1893.

GRACE LYNN (93), schooner, was wrecked at Richmond River, June 1892.

GRAFTON (322), s.s., of Dunedin, was wrecked at Strahan, Macquarie Harbour, June 1898.

GRATIA (186), brig, was lost near Cape Hawke, 15 February 1868, with all the crew.

GRATITUDE (34), tug, sank in collision with s.s. *Manapouri* near Norah Head, 23 March 1910.

GRECIAN QUEEN (119), brig, of Geelong, became missing with all hands, July 1863.

GREYHOUND (231), brig, of Melbourne, was wrecked at Hamelin Harbour, 18 October 1884. Stranding was unavoidable.

GREYHOUND (59), s.s., foundered off Long Reef near Manly, May 1894.

GROWER'S FRIEND (26), s.s., was wrecked at Sydney, July 1910.

GROWLER (36), schooner, was wrecked at Kiama, March 1888.

GUIDING STAR, schooner, left Manning River for Sydney, October 1864, and was never heard of again. Five hands were lost. She ran into very heavy weather.

GUIDING STAR (37), schooner, sank in collision with s.s. *Elingamite* near Newcastle, 18 July 1893. 1 man was lost.

GUINEVERE, cutter, was wrecked at Ferguson Island, Recherche Archipelago, December 1915.

GULF OF CARPENTARIA, s.s., struck an uncharted rock and foundered near Cleft Island, Bass Strait, 15 September 1885.

GULF OF FINLAND, s.s., stranded near Cape Jaffa, 15 February 1881.

GULF OF SIAM, s.s., stranded in Sturt Bay, October 1899.

GUNGA, s.s., stranded on Salamander Reef near Townsville, 23 November 1884.

GWRTHEYRN CASTLE (798), barque, of Sydney, was converted into a hulk, April 1923.

G. W. WOLFF, ship, was wrecked in Bass Strait, August 1912. The captain (who was drowned) was held to blame for not allowing officers access to charts.

GWYDIR (323), s.s., was wrecked at Norah Head, 29 November 1894. 3 lives were lost.

HABITANT (1618), American ship, built in 1885, was burnt in Port Phillip, and is now a floating dock at Williamstown.

HADDA (334), barque, of Newcastle, was wrecked on eastern group of Abrolhos or Houtman's group, 30 April 1877, in consequence of unknown current.

HAM (339), dredge, sank off Sugarloaf Point, New South Wales, on 11 May 1926, while being towed from Surabaya towards Melbourne. No lives were lost.

HANDA ISLE (275), schooner, of Hobart, became missing, October 1919.

HANNAH (104), brigantine, was stolen by pirates in 1844.

HARLECH CASTLE, ship, left Melbourne for Newcastle, 25 June 1870, and was not heard of again. The crew of 23 men were lost.

HARRIER (120), schooner, of Sydney, owned by London Missionary Society, from Papua to Cooktown, was wrecked on reefs near Cape Bedford, 23 July 1891. All were saved and taken to Cooktown.

HARRIET ARMITAGE (233), barque, of Sydney, was wrecked at Ramsay Bay, July 1879.

HARRIET KING (185), brigantine, of Sydney, was wrecked in 1872.

HARRIETT (100), schooner, of Melbourne, was wrecked about 1872.

HARRIETTE NATHAN, brigantine, of Hobart, was wrecked about 1872.

HARRINGTON (35), s.s., of Sydney, was wrecked on Bellinger River Bar, March 1896.

HARRY WOOD (35), ketch, of Hobart, was wrecked at Watson's Bluff, Western Port, May 1916.

HARVESTER, barque, was wrecked on Seal Rocks, 8 June 1900, during heavy southerly gale.

HASTINGS (88), schooner, was wrecked at Byron Bay, July 1889.

HAWKESBURY (80), s.s., was burnt on Hawkesbury River, January 1891.

HAWKESBURY (80), s.s., of Sydney, was burnt, November 1916.

HEATH (187), schooner, was wrecked at Cape Three Points, January 1889.

HEATHER BELL (188), brig, of Sydney, foundered off Crowdy Head, November 1880.

HEBE (214), brig, was wrecked on Stockton Beach, near Newcastle, 10 March 1893, during heavy SE. gale.

HECTOR (115), schooner, of Sydney, from Sydney to Richmond River, with 6 hands, became missing, 3 December 1875.

HELEN (69), was piratically seized in 1849 on the passage to Moreton Bay. The mutineers sailed her to Fiji, where she was recovered at Moala Island in 1850.

HELEN (63), brigantine, of Sydney, was wrecked in 1873.

HELEN, s.s., was lost near Carpenter Rocks, South Australia, 9 February 1882, through incompetence of uncertificated master.

HELENA (126), schooner, of Maryborough, was wrecked at Wide Bay, July 1899.

HELENA DAVIS (54), schooner, capsized on Nambucca Bar, 14 February 1891, during heavy gale. 3 lives were lost; the remainder were saved by the gallantry of Pilot Whaites and his crew.

HELEN ANN, ketch, was wrecked at King Island in 1868.

HELEN MACGREGOR (171), s.s., of Sydney, was wrecked on Clarence River, March 1875. Eight lives were lost.

HELEN MALCOLM (311), barque, of Melbourne, was wrecked at Lacepede Islands, February 1877.

HELEN MARQUIS (128), schooner, was wrecked at River Don, 7 July, 1883, the master being held to blame.

HELEN S. PAGE (217), was wrecked in Newcastle Bight, 30 March 1868, during easterly gale.

HENRI, French ship from Samoa with missionaries and natives, was wrecked off Lake Macquarie, June 1852. No lives were lost.

HENRIETTA (107), schooner, of Sydney, was lost when entering the river at Shoalhaven, 4 February 1880. The master was blamed for entering at an unfavourable time.

HENRY, from Launceston to Adelaide, was wrecked, 9 September 1848, in Symonds Channel, Port Phillip.

HERALD, s.s., foundered off North Head, Port Jackson, 1 April 1884, through the boiler exploding.

HERALD (53), schooner, of Sydney, was wrecked on Horse Shoe Reef, Western Australia, December 1889.

HERALD OF THE MORNING, ship, was destroyed by fire in Hobson's Bay, Melbourne, 16 November 1859.

HERCULES, ship. While in D'Entrecasteaux Channel, bound to Hobart, 29 December 1835, her poop was swept by a sea, and both officers and passengers were lost overboard.

HEREFORD (1440), ship, was lost near Barwon Heads, January 1881.

HEREWARD (1513), ship, of London, stranded during easterly gale on Maroubra Beach, 6 May 1898. No lives were lost. She was refloated later, but while being towed away was driven by a southerly squall on to the rocks, where she broke up.

HERO, barque, was burnt at Geelong, 14 February 1849, scuttled, and raised again.

HERO, ketch, was wrecked, October 1904, at Cape Wollomai, through cables parting in heavy gale. No lives were lost.

HEROINE (130), brig, from Sydney towards Torres Strait with cutter *Ariel* in tow, was wrecked and sank at night on a reef to northward of Percy Island in 1846. 7 lives were lost; the remainder boarded the *Ariel*, which was also ashore but was refloated next day with the help of *Sapphire*.

HEROINE (122), schooner, of Sydney, was beached during a heavy gale in Danger Bay, New South Wales, July 1897. No lives were lost.

HILANDER (93), brigantine, of Sydney, was wrecked in 1872.

HILARIA, ship, was burnt at Port Macquarie, 10 July 1895.

HILDA, schooner, was wrecked at Borley Point, near Ulladulla, 6 February 1895.

HILDA (135), s.s., foundered off Port Hacking, July 1893.

HILDA (65), schooner, was wrecked in Wreck Bay, 30 July 1908.

HIVE, convict ship, was beached and wrecked at Jervis Bay, 13 December 1835. One life was lost.

H.M. WARFIELD, barque, collier, was totally wrecked at Bird Island, New South Wales, 2 July 1867.

HOKITIKA, barque, of Melbourne, was wrecked off Cape Leeuwin, 2 November 1872.

HONOLULU MARU (5751), Japanese s.s., from Melbourne to Sydney, shifted her cargo in heavy gale and listed heavily, 3 April 1924. H.M.Ss. *Dauntless* and *Dragon* stood by her until the arrival of a tug, which towed her into Jervis Bay. £6000 salvage was paid.

HOOLET, ketch, was wrecked at Mooloolah River, July 1889.

HOPPER No. 27 (111), barge, of Brisbane, was wrecked at Mackay Island in 1914.

HORNET (38), s.s., lighter, foundered off North Head, Sydney, 19 March 1915, with loss of the master.

HOWARD, barque, was beached in Ringarooma Bay, Tasmania, 10 March 1886. She got into a dangerous position through careless navigation.

HOWLET, ketch, was wrecked in Seal Rock Bay, New South Wales, in July 1876. Several lives were lost.

HUGH EWING (176), schooner, was wrecked on Swain Reefs, south of Great Barrier Reef, August 1886.

HYDRABAD, ship, was wrecked in Cumberland Passage, north-eastern Torres Strait, near Murray Island, 25 May 1845. The crew reached Port Essington in the schooner *Shamrock* and were carried to Sydney in H.M.S. *Fly*.

IBIS (357), brig, of Sydney, was condemned, August 1919.

IDA, ketch, was wrecked at Nelson Bay, Port Stephens, 20 June 1911.

ILLALONG (182), paddle steamer, of Sydney, was broken up in 1878.

ILLAROO, s.s., was wrecked at Catherine Hill Bay, 1 June 1903, while leaving the jetty. No lives were lost.

ILLAWARRA, s.s., in 1881 came into collision with s.s. *Civility* (q.v.).

ILMA (345), brigantine, of Hobart, came into collision with Fiji government s.s. *Ranadi* off Barranjuey, 17 June 1910, but reached port safely.

INDEX (43), ketch, of Sydney, foundered at Port Douglas, October 1891.

INDIA (885), s.s., of Sydney, foundered on New South Wales coast, 1 May 1884. Inquiry was held at Newcastle, and it was held that she was justifiably abandoned before sinking.

INDIANA (252), brigantine, was wrecked at Cape Barren, Bass Strait, June 1894.

INDUSTRY, cutter, was lost at Broulee Island, near Moruya River, in 1845.

INDUSTRY, of Sydney, stranded in 1876.

INFLEXIBLE (119), s.s., of Sydney, foundered on the coast of New South Wales, August 1889.

INGEBORG, barque, Italian, from New Zealand to Newcastle, sank in collision during the night with s.s. *Arawatta* off Port Stephens, 14 August 1907. 7 lives were lost. Probably she had no sidelights burning.

INGLISS, brigantine, was driven ashore in Brunswick River during easterly gale, September 1879.

INNAMINCKA (2500), s.s., during a hurricane, 29 January 1913, was driven along with both anchors down, and stranded on Alexandra Reef, off Cairns. She was refloated later.

INO (40), ketch, was wrecked off Kiama, September 1889.

INTEGRITY (51), ketch, foundered in Broken Bay, January 1889.

INVERLOCHY, barque, was wrecked at Geelong, 8 December 1902.

INVESTIGATOR (360), s.s., of Adelaide, was wrecked at Wardang Island, April 1918.

IOLANTHE (11), cutter, was wrecked at Cossack, January 1894.

IONA (31), s.s., of Brisbane, was burnt, August 1889.

IRENE, steam launch, drifted, with engines disabled, on to rocks at Cape Three Points, and was totally wrecked, 10 November 1908.

IRENE (11), ketch, was wrecked on Warrior Reef, Torres Strait, May 1913.

IRIS (38), paddle steamer, foundered at Saddle Back Island, November 1888.

IRIS (192), schooner, was wrecked at Smithton, Tasmania, June 1914.

IRON KING, foundered off Troubridge Island, 11 December 1873.

IRON MONARCH (4260), s.s., was blown ashore in southerly gale while anchored at Port Kembla, 8 July 1923. She was towed off next day, severely damaged.

IRON PRINCE (3116), s.s., of Sydney, was wrecked off Cape Howe, 19 April 1923, on voyage from Devonport to Newcastle. All hands were saved.

ISABEL (44), schooner, of Launceston, foundered at Hummock Island, Bass Strait, October 1894.

ISABEL (69), schooner, of Sydney, was wrecked at Crowdy Bay, May 1898.

ISABEL (19), ketch, of Townsville, foundered at Hook Island, Whitsunday Passage, September 1899.

ISABELLA, sealing schooner, from Launceston to Kangaroo Island, was wrecked at Portland Bay, 30 March 1837. She was owned by John Hart (q.v.).

ISABELLA, ship, from Melbourne to London, was wrecked in Kent group, Bass Strait, 21 June 1844. No lives were lost.

ISABELLA, government schooner, was wrecked at King Island, July 1845. No lives were lost.

ISABELLA (195), brig, of Hobart, was wrecked about 1874.

ISABELLA BROWN (359), ship, of Melbourne, was wrecked in 1871.

ISABELLAS (268), brig, of Newcastle, was wrecked at Lacepede Islands, February 1877.

ISABELLA WATSON, was lost at Port Phillip Heads, March 1852, with 9 lives lost.

ISERBROOK (208), hulk, of Sydney, was wrecked in Port Jackson, October 1880.

ISLE OF FRANCE (312), barque, of Hobart, was wrecked at Eddystone Point, October 1877.

ITALY (286), barque, of Hobart, was wrecked on a reef near Bunker group, 16 November 1885.

ITATA (950), barque, was completely destroyed by fire at Newcastle, 12 January 1906. She was loaded with part coal and part cargo of nitrate from Iquique. She was beached and burning for three days.

IVANHOE, ship, was lost on the northern coast of Tasmania, 17 August 1879. Improper courses had been steered, and the master's certificate was cancelled.

IVYDALE (12), schooner, foundered near Wallal, 16 July 1916, during cyclonic gales.

J1, J2, J3, J4, obsolete submarine boats were dismantled and sunk by gunfire outside Port Phillip in May and June 1926.

JAMES PATERSON (570), hulk, was abandoned at Townsville in 1891.

JAMES SERVICE. See Section III.

JAMES WILSON (326), barque, of Melbourne, became missing in 1883.

JANE (160), schooner, of Melbourne, was wrecked at Cape Bridgewater, June 1863.

JANE (180), brig, was lost in September 1867 at Warrnambool in consequence of defective cables and negligence.

JANE (160), brig, was wrecked at Richmond River, July 1886.

JANE ANDERSON (96), schooner, of Dunedin, foundered at Bathurst Island, July 1886.

JANE BELL (191), brig, of Adelaide, was wrecked about 1870.

JANE SPIERS (309), barque, of Melbourne, stranded on Rodongo Island, Bass Strait, April 1877, and was refloated. She was wrecked at Twofold Bay, New South Wales, January 1878.

JANET, ketch, of Sydney, became missing and is supposed to have foundered in heavy easterly gale, 13 July 1866, with all hands.

JANET (211), schooner, was wrecked at Rottnest Island, 11 December 1887.

JENNIE PARKER (975), hulk, was broken up at Goode Island, Torres Strait, 1905. She had been a ship of St. John, New Brunswick, left Newcastle for Ilo, Peru, February 1894, struck a reef, and was condemned at Brisbane and converted into a coal hulk.

JENNIE SCOTT (38), ketch, was wrecked on Channel Rock, Maryborough, May 1890.

JENNY LIND (the second), was wrecked in Bustard Bay in 1857, and refloated, June 1857. For *Jenny Lind* see also Section III.

JESSIE, schooner, was lost at Paterson River, 12 March 1830.

JESSIE, cutter, was lost at Port Stephens with all hands, October 1837.

JESSIE, schooner, of Sydney, foundered, 9 May 1869, in SE. gale off Newcastle, with loss of three hands.

JESSIE, ketch, sank in collision with s.s. *Peterborough*, June 1905, off South Head, Sydney. One life was lost.

JESSIE DARLING, foundered off Semaphore lighthouse, Port Adelaide, April 1907, after striking the sunken ship *Norma*.

JESSIE DAVIS (29), ketch, was burnt at Kolan River, December 1888.

JESSIE KELLY (145), schooner, was wrecked at Port Stephens, 20 November 1886, through missing stays.

JESSIE MATILDA (88), brigantine, was wrecked on Evans Reef, N.S.W., July 1889.

JESSIE SINCLAIR, ketch, stranded at Port Macquarie, August 1898.

JESSIE SPEARS (38), ketch, of Sydney, was wrecked in September 1881 while endeavouring to return into Camden Haven. No blame was attached to the master.

J. G. KONDIO (92), schooner, of Sydney, is supposed to have foundered on the coast of New South Wales, May 1898.

JOHN (12), pearl lugger, was wrecked at Broome, 19 November 1910, during a hurricane.

JOHN ALCE, government vessel, was dismasted and blown under the jetty at Darwin during a hurricane, 16 November 1921.

JOHN NUSSEY (170), brigantine, of Melbourne, was wrecked near Western Port, August 1858.

JOHN PENN (122), s.s., of Sydney, was wrecked at Burrawurra Heads, 24 November 1879, in foggy weather.

JOHN SCOTT (150), brig, of Fremantle, was wrecked on the coast of Victoria, August 1858

JOHN SOUCKAY, struck a reef off the eastern side of King Island, Bass Strait, 27 March 1849.

JOKER, ketch, was wrecked at Port Stephens, 13 November 1887, through missing stays in heavy weather.

JOLIBA, barque, stranded on Southern Flats, Fremantle, May 1881. The pilot was to blame.

JOLLY RAMBLER, cutter, was wrecked at Macleay River, December 1836.

JONATHAN (43), ketch, was wrecked on Oyster Bank, Newcastle, 30 September 1891.

JONES BROTHERS (132), schooner, of Sydney, was wrecked on Oyster Bank, Newcastle, 31 August 1905, 7 lives being lost. She left Newcastle in tow of s.s. *Helen Nicol*, a strong SW. gale came on, and she decided to return to Newcastle. The tow-line parted near Nobby's.

JOSEFA, barque, German, was dismasted off Seal Rocks and towed into Newcastle, 5 August 1908.

JOSEPH WELLER (60), schooner, was wrecked at Nobby's, Newcastle, January 1837.

J. T. BERRY, ship, United States of America, was burnt, turned turtle, and foundered off Port Stephens, New South Wales, June 1888, after her anchors had held her bottom up and several unsuccessful attempts had been made to tow her.

JULIA (630), ship, from Melbourne to Calcutta, anchored near Port Phillip Heads and became on fire, 7 September 1853. She slipped cable and was beached near Point Nepean, where the fire was extinguished and she was eventually refloated.

JULIA (138), brig, of Melbourne, was wrecked near Portland, August 1863.

JULIA, schooner, was lost in Trial Bay, 2 June 1864.

JULIA (12), pearl lugger, was wrecked near Wyndham, 20 November 1892, during a cyclone.

JULIA HEYNE (318), barque, of Melbourne, foundered twenty miles from Cape St. George, 20 May 1865.

JULIA M. AVERY, brig, stranded on C Reef, near Cooktown, 13 February 1885, through improper orders given by the master, who also showed that he had no intention of trying to get her afloat again.

JULIA PERCY, s.s. See *Nelson*.

JULIUS (48), schooner, foundered at Ninety Mile Beach, May 1892.

JULIUS VOGEL (56), schooner, was wrecked at Tomakin, April 1890, during heavy southerly weather.

JUNIOR, American whaler. The crew mutinied off New Zealand, killed the master and third mate, and badly wounded the first and second mates, whom they forced to navigate the vessel to New South Wales. 10 mutineers left the ship off Cape Howe, 7 January 1858; 4 landed and were captured; 6 were not again heard of. The ship arrived at Sydney, 10 January.

JUNO, s.s., was wrecked north of Manning River, 24 October 1853. 6 lives were lost.

JUPITER, brig, Sydney to Singapore, ran ashore at the entrance to Port Raffles in 1830. She left Sydney on 20 April 1829.

JUPITER (13), pearl lugger, was wrecked at Broome, 19 November 1910, during a hurricane.

JUST IN TIME (102), schooner, was wrecked at Charlotte Bay, April 1893.

KADINA (662), barque, of Adelaide, stranded at Wallaroo River, May 1875, and was converted into a hulk at Adelaide. She was burnt at Port Adelaide, April 1879.

KALAHONE, barque, was wrecked at King Island in 1879.

KALARA, s.s., foundered off Tweed River, 6 November 1886, through a leak caused by passing over the fluke of her anchor when going out to the bar.

KALUDAH (93), s.s., was burnt at Gladesville, Sydney, 22 March 1911.

KAMERUKA, s.s., was wrecked at Pedro Point, near Moruya, 16 October 1897. All were saved.

KANAHOOKA (239), s.s., foundered in the Gulf of Carpentaria, 17 January 1894. Several lives were lost, the rest being saved by the bravery of missionaries and their natives.

KANGAROO (44), paddle steamer, sank in Brisbane River and was broken up, June 1889.

KANSAS (6074), Ellerman and Bucknell s.s., was severely damaged by fire at Brisbane through ignition of fuel oil, 6 April 1924.

KARAMU (934), Union Co. s.s., formerly named *Gale*, struck the bar while leaving Strachan and soon after leaked badly, water putting her fires out. She was anchored off South-west Cape (Tas.) in a SW. gale, and s.s. *Kanna* also anchored near her. All hands were saved with great difficulty and danger, and she then sank, 4 September 1925.

KARAWEERA (1021), s.s., of Adelaide, was wrecked at Rockhampton, August 1902.

KAROLA (201), brigantine, of Sydney, was wrecked at Morna Point, Newcastle, 25 May 1896, during SE. gale. 2 lives were lost.

KARORA (160), schooner, was wrecked at Tacking Point, March 1917.

KARRAWATTA (1271), s.s., of Fremantle, was wrecked in King Sound, March 1901.

KATE (85), schooner, is supposed to have foundered off Mackay, February 1888.

KATE (341), barque, of Sydney, was wrecked in 1872.

KATE (104), paddle steamer, sank in Moreton Bay in 1890.

KATE, s.s., sank in collision off Sydney Heads, 2 April 1914.

KATE CONLEY, large brig, from Cairns to Sydney, was wrecked in a storm in Temple Bay, and the crew of 8 men perished, 8 March 1878.

KATE IRVING, barque, stranded at Port Adelaide, 20 November 1883, through bad steering.

KATE MONAGHAN (102), schooner, of Newcastle, was wrecked in 1875.

KATE TATHAM, brigantine, stranded in Cloudy Bay, Tasmania, 9 August 1888, through careless navigation.

KATHERAW (44), schooner, of Geelong, was wrecked on King Island, December 1872. No lives were lost.

KATHERINE, was wrecked at King Island in 1861.

KATOOMBA, old interstate s.s., in February 1905 was filled with cement and sunk on Oyster Bank, Newcastle, together with s.s. *Elamang*, to form extension of northern breakwater.

KAWATIRI (322), s.s., of Hobart, while arriving at Strachan from Hobart, struck breakwater and sank, August 1907. 6 lives were lost.

KEBROYD (363), barque, of Adelaide, was wrecked at Fremantle, May 1890.

KEERA (158), s.s., of Sydney, was converted into a hulk in 1879.

KELLERMONT (200), brigantine, was wrecked in Broken Bay, during heavy SE. gale, 16 February 1868.

KELLOE (340), s.s., of Sydney, foundered after collision off Botany Bay, 13 May 1902.

KENT (104), schooner, of Sydney, left Trial Bay, 29 January 1890, ran into SE. gale, and was not again heard of. She is supposed to have foundered on the coast of New South Wales, February 1890. All hands were lost.

KEPLER (45), schooner, was wrecked at Hopetoun in August 1910.

KERANGIE (777), s.s., of Melbourne, was wrecked at Cape Everard, February 1879.

KERMANDIE (37), ketch, of Melbourne, became missing in December 1892.

KIANDRA, barque, was badly damaged by fire at Dalton's Wharf, Dawes Point, Sydney, 12 June 1886.

KIELAWARRA (486), s.s., of Sydney, sank in collision with s.s. *Helen Nicol* off North Solitary, 7 December 1886. 36 lives were lost.

KILTIE, drogher, was destroyed by fire at Cape Hawke, 4 June 1921.

KILTOBRANKS (272), s.s., stranded and became a total wreck at Shellharbour, 21 February 1924.

KINCUMBER (84), s.s., struck the breakwater at Manning River, and became a total wreck, 22 August 1908. 2 lives were lost.

KINGSLEY (42), s.s., of Sydney, was wrecked at Morna Point, 16 April 1902.

KING WILLIAM THE FOURTH (84), s.s., was wrecked on Oyster Bank, Newcastle, 2 July 1839. Her engines were salvaged and placed in the *Sovereign*.

KIRKCUDBRIGHTSHIRE (1482), ship, of Fremantle, had her register cancelled, July 1922.

KITTY COBURN (405), brigantine, of Melbourne, was wrecked at Port Augusta, December 1875.

KOH-I-NOOR, barque, while on voyage from Newcastle to Wallaroo, struck a rock off Hummock Island, Bass Strait, and was abandoned on account of making water rapidly, July 1873.

KOH-I-NOOR, barque, was sunk by collision with s.s. *Rob Roy* in Yarra River, April 1876.

KONDIO, schooner, was wrecked about 1900, with 6 lives lost.

KOOKI (14), cutter, was wrecked at Barrongand Creek, March 1912.

KOOMBANA (2182), s.s., left Port Hedland for Broome, 20 March 1912, and foundered off Balla Balla, near Condon, with all hands, during a hurricane, 138 lives were lost.

KOONYA (663), s.s., of Dunedin, was wrecked off Sandy Cape, Tasmania, 7 June 1919.

KOONYA (80), s.s., of Sydney, was wrecked at Cronulla Beach, January 1898.

KOORINGA (309), s.s., of Melbourne. While bound from Melbourne to Burnie, Tasmania, her cargo of petrol caught fire and in a few minutes the whole vessel was ablaze, so that she was abandoned by her crew when 26 miles from Cape Schanck, 14 July 1926. No lives were lost.

KORUNAH, ketch, was lost in 1921, with 6 lives lost.

KURRARA, motor launch, capsized off Tweed Heads in 1914. 7 lives were lost.

KWINANA (2130), s.s., of Fremantle, was dismantled, October 1921.

LA BELLA (365), schooner, of Lyttelton, was wrecked on a reef off Warrnambool, November 1905. 7 were drowned, 5 saved in heavy weather by lifeboat. The master was blamed for attempting to enter without a pilot.

LADY BELMORE (254), labour brig, of Maryborough, was wrecked during a heavy gale at Mackay, March 1882. The master was blamed for not using every endeavour.

LADY BOWEN (892), barque, of Sydney, was condemned as a hulk in 1888.

LADY BOWEN (671), schooner, of Sydney, was wrecked on Kennedy Shoal, Queensland, August 1894.

LADY DARLING (534), s.s., stranded on Green Cape, May 1866, the proper course not having been steered.

LADY DARLING (722), s.s., of Melbourne, was wrecked at Montagu Island, November 1880.

LADY ELIZABETH, barque, stranded at the entrance to Swan River, 30 June 1878.

LADY EMMA (202), barque, of Hobart, was condemned at Hobart, September 1879.

LADY EMMA, was wrecked on the coast of Tasmania, February 1840.

LADY EMMA (128), schooner, of Sydney, was wrecked in Port Jackson, April 1880. The master, under influence of alcohol, refused to leave the vessel, and was drowned.

LADY HARVEY, brig, from Glasgow to Melbourne, was wrecked on Point Lonsdale, Port Phillip Heads, 29 April 1854. No lives were lost. Her cargo was discharged, and she was then abandoned.

LADY KINNAIRD, ship, was wrecked near Cape Burr, Spencer Gulf, in 1880.

LADY LEIGH (118), schooner, of Hobart, was wrecked about 1872.

LADY MARY PELHAM (207), brig, of Portland, left Sydney, 15 July 1849, and was wrecked in August at Port Fairy, Victoria, in a heavy gale through her cables parting.

LADY MILDRED (1382), s.s., of Newcastle, was wrecked in Bass Strait, March 1909.

LADY MUSGRAVE, s.s., was beached at Double Island Point to prevent foundering, 25 January 1888, having been sent to sea with stern glands leaking.

LADY MUSGRAVE, s.s., was wrecked off Ballina, Richmond River, 27 March 1904.

LADY OF LORN (56), ketch, was wrecked at Fernmount, July 1889.

LADY WELLINGTON, was wrecked on the coast of Australia, 1838.

LADY YOUNG (418), barque, was wrecked near Rabbit Island, 14 July 1865.

LADY YOUNG (77), schooner, of Adelaide, became missing with all hands about 1872.

LADY YOUNG (421), paddle steamer, of Sydney, was broken up at Sydney, May 1881.

LALLA (525), hulk, of Fremantle, was destroyed by gun-fire in target practice, August 1917.

LANSDOWNE (73), ketch, foundered near Norah Head, 7 April 1911.

LA PEROUSE (113), schooner, of Sydney, foundered off Clarence River, December 1878.

LAPWING (11), pearl lugger, was wrecked near Onslow, 7 February 1911, during a hurricane.

LAURA, ketch, of Sydney, was abandoned and lost outside Camden Haven, June 1878.

LAVINA, schooner, of Sydney, was wrecked at Port Stephens, September 1869.

LAWRENCE, barque, was wrecked on a rock off Barren Island, Bass Strait, in 1869.

LAWRENCE FROST, stranded at Port Phillip Heads, 17 August 1856, but got off and sailed for Sydney to be docked. In a sinking condition she put into Twofold Bay, 26 October, where she sank.

LEICHHARDT (46), s.s., of Sydney, was burnt in 1916.

LEONARDO (521), Italian barque, from Sydney to the Mauritius with general cargo, was wrecked off Travers Island near Torres Strait, 14 August 1904. The crew reached Thursday Island safely.

LEONIDAS (270), barque, of Sydney, was lost in 1873.

LEPRENA, schooner, from Adelaide to Hobart, was wrecked near Eddystone lighthouse, Tasmania, during the night of 27 February 1925. All hands landed safely.

LEURA (758), s.s., of Melbourne, was converted into a hulk in 1921.

LEYTON (15), ketch, of Sydney, foundered in Torres Strait, January 1914.

LIALEETA (82), ketch, from Spencer Gulf to Melbourne, became missing with 6 men, April 1925. She left Adelaide on 15 April.

LIBERTY, schooner, was wrecked at North Head, Sydney, 20 January 1830.

LIFFEY (102), brigantine, of Sydney, was wrecked at Richmond River, July 1898.

LIGHTNING, schooner, was lost on Albany Island in Torres Strait in 1856. 12 of the crew were murdered by natives of Newcastle Bay; 5 escaped.

LIGHTNING (2084), wooden clipper ship, was burnt alongside the wharf at Geelong, 31 October 1869, while loading wool, and was blown up, 21 April 1870. She was one of the most famous of the Black Ball Line, James Baines owner. In 1857, under command of Captain Enright, she sailed 436 miles in 24 hours, the best day's run on record for a sailing-ship.

LIGHT OF THE AGE (1287), ship, Black Ball liner, built 1855, made regular voyages to Australia until 16 January 1868 when, while on voyage from Liverpool to Melbourne, she was lost off Point Lonsdale through incapacity of the master, whose certificate was cancelled.

LILIAN, ketch, of Sydney, dragged anchor during a gale and was driven on a sandbank in Port Stephens, 30 July 1877.

LILIAN, s.s., stranded at Port Macquarie, 25 June 1887. She was navigated too close to shore and prematurely abandoned.

LILLIAN (33), ketch, of Sydney, dragged anchor during a gale and was driven on to a sandbank in Port Stephens, 11 September 1876.

LILLIAN (43), schooner, of Hobart, was abandoned and sank in fine weather, 5 miles from Broken Bay, January 1877, under suspicious circumstances, no effort being made to save her. The master's certificate was cancelled.

LILLIAN, ketch, capsized in Newcastle Harbour, 17 November 1879, being caught by a squall while in stays.

LILY (248), barque, of Adelaide, was wrecked in 1873.

LILY, s.s., stranded near Morna Point, near Port Stephens, 19 March 1885. The rudder became useless and anchors would not hold.

LILY (45), s.s., of Sydney, was burnt in 1911.

LINDISFARNE, ship, was wrecked on King Island in 1867.

LINDUS (1080), s.s., was wrecked on Oyster Bank, Newcastle, 4 June 1899. No lives were lost.

LION (216), barque, of Sydney, was wrecked in 1873.

LISMORE (215), s.s., was wrecked at Richmond River, 8 June 1885. No blame was attached to the master, as the channel is an intricate one.

LISMORE (181), schooner, sank in collision at Clarence River, November 1891.

LITTLE VIOLET, harbour s.s., sank in collision with s.s. *Undine* in Port Jackson, 11 February 1888, 2 lives being lost.

LIZZIE DAVIS, schooner, was wrecked near Tacking Point, 15 January 1886, through navigating too close to land and missing stays.

LIZZIE FROST (52), ketch, was wrecked at Brunswick River, January 1888.

LLEWELLYN (359), s.s., of Sydney, was wrecked on Belambi Reef, 23 May 1882. She was navigated too close inshore.

LOCH ARD (1624), iron clipper ship, built in 1873, was lost on her third voyage from London to Melbourne, going ashore at Curdie's Inlet, 27 miles from Cape Otway, 1 June 1878. Out of 52 people aboard, only 2 were saved, a young apprentice and a girl passenger whom he rescued.

LOCH FINLAS (2170), ship, of Liverpool, was wrecked on the Tasmanian coast, 6 September 1908.

LOCHIEL, ship, foundered in Straits of Sunda in 1859.

LOCH KATRINE (1200), iron clipper ship, built in 1870, continued in Australian trade until 1910. She was dismasted off Cape Howe, towed into Sydney, sold, and turned into a coal hulk.

LOCH LEVEN (1200), iron clipper ship, on voyage from Geelong to London, was lost on King Island, through the master neglecting ordinary precautions in thick weather. The captain went back to her to get papers, but the boat capsized in surf and he was drowned, 24 October 1871. No other lives were lost.

LOCH LOMOND, schooner, was wrecked at King Island, Bass Strait, in 1891.

LOCH SLOY (1200), iron clipper ship, was wrecked on Kangaroo Island during passage to Adelaide, 24 April 1899. She struck rocks at night and only 4 men reached shore.

LOCH VENNACHAR (1485), iron clipper ship, on Australian trade from 1875 to 1905, when she was lost, September 1905, with all hands off Kangaroo Island while running for Adelaide from London. She

had been run down in the Thames, November 1902, on voyage from Melbourne, and was refloated in December.

LOIS (393), barque, of Newcastle, was wrecked at Broome, July 1890.

LOLA, Sydney-built yacht, sold for New Hebrides trade, was wrecked in Malo Pass in heavy westerly gale, 2 March 1905. No lives were lost.

LONE STAR (151), brigantine, of Hobart, was wrecked near Rockhampton, September 1871.

LORD ASHLEY (296), s.s., of Sydney, stranded and broke up near Terrigal Harbour, 8 September 1877. The loss was due to her making water and being steered for shore before becoming helpless.

LORD AUCKLAND (500), transport, was repaired in Port Curtis in 1847, after being very badly damaged by stranding on reefs outside.

LOTTERY (150), brigantine, of Melbourne, became missing with all hands in February 1878.

LOUISA, was wrecked on the Tasmanian coast, October 1836.

LOUISA (370), barque, was lost at Brunswick River, May 1849. See schooner *Swift*.

LOUISA BAILLIE, ship, from London, ran ashore on Swan Island, Port Phillip, October 1853.

LOUISA MARIA (39), schooner, of Brisbane, was burnt by natives at Whitsunday Island, August 1878.

LOUISE LAMONT (68), schooner, foundered in Bass Strait, March 1901. Several lives were lost.

LOVET PEACOCK (309), schooner, of Sydney, was wrecked off Nobby's, Newcastle, June 1879.

LOWESTOFT, was wrecked on the Tasmanian coast, July 1838.

LUBRA, was wrecked while entering Warrnambool, June 1877, through accident beyond control of the master.

LUBRA (279), s.s., was wrecked at Catherine Hill Bay, February 1920.

LUCIFER (13), pearl lugger, was wrecked at Broome, 19 November 1910, by hurricane, with several lives lost.

LUCRETIA, ship, was burnt in Sydney Harbour, 23 June 1839.

LURLINE, was wrecked at Port Stephens in 1869, with the crew saved.

LYDIA, ketch, of Sydney, was wrecked in heavy easterly weather, 13 July 1866.

LY-EE-MOON (745), s.s., of Sydney, a favourite passenger ship, was wrecked off Green Cape, during a fine night, 30 May 1886. 76 lives were lost. She was said to have been recklessly navigated close to the shore.

MAAFU, schooner, was lost with all (8) hands between Sydney and Manning River, about 16 September 1873.

MABEL WHITE (84), schooner, foundered at Richmond River, 29 March 1894.

MACEDON (532), s.s., stranded on Kingston Spit, 25 March 1883.

MACKSVILLE, s.s., foundered off Scots Point, D'Entrecasteaux Channel, Tasmania, and became a total loss, 2 January 1924.

MACLEAY, s.s., stranded at Port Macquarie, July 1898, during a southerly gale.

MACLEAY (291), s.s., foundered near Boondelbah Island off Port Stephens, 11 October 1911. 15 lives were lost, with only 2 survivors.

MACLEAY PACKET, schooner, left Sydney, 30 April 1864, for Richmond River, and was not heard of again. 10 lives were lost.

MACQUARIE (125), brigantine, was lost in Shark Bay, 14 November 1878.

MADEIRA PACKET, was wrecked on the Queensland coast, November 1831.

MADJUS, s.s., was abandoned between Broughton Islands and Seal Rocks, October 1884. She injured herself through heavy labouring in bad weather.

MAFFRA (46), schooner, was wrecked at Point Nepean, May 1888.

MAGDA, barque, from Geelong to Batavia, was wrecked on Melville Island, 1 June 1858. 13 men left in a boat for Port Essington and were not again heard of. The rest were brought to Sydney in the schooner *Shamrock*.

MAGGIE (191), brig, of Sydney, was wrecked off northern Queensland, June 1878.

MAGGIE (38), ketch, was wrecked at Wollongong, November 1890, during southerly gale.

MAGGIE SCOTT (30), ketch, foundered at Shoalhaven, June 1889, during southerly gale.

MAGGIE TAYLOR (37), ketch, of Sydney, foundered at Camden Haven, March 1889.

MAGNET (153), brig, of Melbourne, was wrecked in 1872.

MAID OF ATHENS, ship, was wrecked on Great Barrier Reef near Sir Charles Hardy Island, 29 May 1845, with no lives lost. The crew were taken aboard the ship *Spy*.

MAID OF ERIN (152), brig, of Hobart, was wrecked at Port Davey, Tasmania, June 1877.

MAID OF JULPHA, brig, was completely destroyed by fire at Warrnambool in 1859.

MAID OF THE MILL, formerly *Native*, Parramatta River s.s., sank at Clarence River Wharf, Sydney, March 1855.

MAID OF THE VALLEY (128), brig, of Adelaide, was wrecked in 1857.

MAITLAND, s.s., became on fire and sank at Coles Wharf, Sydney, 7 February 1852.

MAITLAND (103), s.s., coastal trader from Sydney, built in 1838. In 1851 she was sent to Port Phillip and employed there as a tug for several years, until she sank in Saltwater River. After being raised, repaired, and re-named *Sampson*, she was employed on the New Zealand coast, and in the late sixties was wrecked at Hokitika.

MAITLAND (555), paddle passenger s.s., was wrecked near Cape Three Points between Sydney and Newcastle, 5 May 1898, in heavy SE. gale. She lost 15 passengers and 11 crew, the rest being saved by means of a rope most gallantly taken ashore and hauled through heavy breakers.

MALCOLM (182), brigantine, foundered off Bulli jetty, February 1898 during heavy weather. 7 of the crew were drowned.

MANA (107), schooner, of Fremantle, was wrecked at that place, September 1898.

MANAPOURI, s.s., stranded at Grant Point, Melbourne, 7 September 1891. Refloated, she was damaged by fire at Woolloomooloo, Sydney, 18 September 1902.

MANFRED, schooner, was lost in a hurricane off Broome, 24 January 1879.

MANUREWA (327), barque, of Sydney, after leaving Newcastle with a cargo of coal, became missing with all hands, March 1922.

MAORI (288), barque, sprang a leak and foundered off Western Port, 10 September 1863.

MARCHIONESS, brig, from South Africa, struck a reef off Point Lonsdale, October 1853, and was beached on Swan Island, Port Phillip.

MAREEBA (1077), s.s., was wrecked at Stockton Beach, nine miles north of Newcastle, 28 July 1908, during strong SE. wind.

MARGARET (236), barque, of Sydney, was not heard of after 1877.

MARGARET AND AGNES (103), schooner, of Melbourne, was wrecked at Portland, July 1852.

MARGARET AND MARY (177), brigantine, of Sydney, was wrecked in 1871.

MARGARET BROCK, ship, was wrecked west of Cape Bernouilli, South Australia, about 1840.

MARGARET ELIZA, schooner, foundered five miles from Cape Three Points, 15 August 1864.

MARGARET JANE (68), schooner, was wrecked at Trial Bay, January 1895.

MARGARET NICHOL (118), schooner, of Melbourne, was wrecked near Gabo Island, December 1859.

MARGIT (1241), barque, of Norway, was wrecked at Coorong Beach, 1912.

MARIA, was wrecked off South Australia in 1840.

MARIA, ship, was wrecked at Port Phillip Heads in 1853. A pilot was dismissed from service for not having boarded her when signalled for.

MARIA (156), crazy old brig from Sydney for New Guinea, was wrecked, February 1872, on Bramble Reef, off Cardwell, with a party of 75 gold-seekers. There was no navigator aboard. 12 were drowned on the wreck, 14 killed by blacks, 9 drowned off rafts; 40 survived and were assisted by H.M.S. *Basilisk*.

MARIAN, ship, was wrecked in 1851 on Marian Reef, near Troubridge Shoal, Investigator Strait, off Kangaroo Island, South Australia.

MARIAN MAYFIELD (32), s.s., was wrecked at Cape Hawke, 14 January 1913.

MARIANO, barque, was lost in Butcher Inlet, 23 December 1878, during heavy easterly gale.

MARIE (51), s.s., of Sydney, was burnt in 1914.

MARIE GABRIELLE, was wrecked 20 miles west of Cape Otway, 25 November 1869.

MARINA (529), barque, from Sydney to Kalpara, thence to Calcutta, was wrecked on Great Barrier Reef, Queensland, 5 October 1859, near Raine Island. The crew all arrived safely at Port Curtis. The wreck was burnt next year.

MARION (68), schooner, was wrecked at Cape Flattery, 28 December 1906, during a hurricane.

MARION FENWICK (66), s.s., was wrecked at Marley Beach, Port Hacking, 11 February 1898.

MARITANA (13), pearl lugger, was wrecked at Broome, 19 November 1910, during a hurricane. Several lives were lost.

MARJORIE (14), pearl lugger, was wrecked at Broome, 19 November 1910, during a hurricane. Several lives were lost.

MARLBOROUGH HILL, 4-masted barque, was severely damaged by fire at Newcastle, September 1906, but was repaired in Sydney.

MARLOO (1676), s.s., was wrecked near Indian Head, Queensland, 27 September 1914. No lives were lost.

MARMION, brig, of Sydney, was wrecked off Port Phillip Heads, May 1853.

MARQUIS OF ANGLESEA, ship, from London, was lost on Swan River, November 1829.

MARQUIS OF ARGYLE (500), barque, of Sydney, foundered, November 1879.

MARSHALL, s.s., was wrecked at Wide Bay, July 1897.

MARTEN, schooner, was wrecked on Abrolhos group in 1878.

MARTHA, schooner, of Sydney, foundered at sea during heavy SE. gale, 9 May 1869, presumably off Anna Bay, near Port Stephens, with loss of all hands.

MARTHA (39), schooner, foundered at Port Phillip Heads, March 1895.

MARTHA AND ELIZABETH, was lost off Jervis Bay, 26 April 1855.

MARTHA AND LAVINIA, schooner, was wrecked on the eastern side of King Island, in 1871.

MARTHA RIDGWAY, ship, was wrecked in 1840 in Wreck Bay on Great Barrier Reef near Safe Entrance. She was a conspicuous mark for years afterwards. She drifted on the reef during the night, having been embayed in light breezes and unable to beat out. Part of the 50th Regiment were aboard; all were saved by a vessel in company.

MAKUMA, schooner, left Sydney, 10 September 1903, and was not heard of again. Rough southerly weather prevailed during the next week.

MARVEL (49), s.s., was stranded in Shoalhaven Bight, 24 November 1892.

MARY, passenger ship, Sydney to London, was wrecked on a reef in Bass Strait, near Flinders Island, 24 May 1844. Of 59 aboard 17 were lost, 16 of them being women, through the upsetting of the boat, which contained all the women passengers. Though there was almost a calm, she broke up in 7 minutes.

MARY (162), brig, of Melbourne, was wrecked in 1874.

MARY (12), pearl lugger, of Fremantle, foundered near Cossack, March 1889, during a hurricane. Several lives were lost.

MARY AND EDITH (454), brig, of Sydney, was wrecked in 1872.

MARY AND ROSE, was wrecked near the entrance to Port Stephens, 12 July 1866. 5 were lost, 2 saved.

MARY ANN, schooner, turned turtle. Her crew arrived at Sydney in s.s. *Rose*, October 1843.

MARY ANN, schooner, was wrecked at King Island in 1868. No lives were lost.

MARY ANN (104), schooner, of Fremantle, was wrecked, July 1876.

MARY BANNATYNE (116), schooner, was wrecked on Clarence River Bar, 8 February 1886, while attempting to enter when stand-off signal was flying.

MARY BURGESS (41), ketch, was wrecked at Thouin Bay, October 1916.

MARY CAMPBELL (144), brigantine, was abandoned off Cape Hawke, April 1889.

MARY CUMMING (106), schooner, of Melbourne, was wrecked in 1872.

MARY ELIZABETH, was wrecked on the Tasmanian coast, 30 May 1835.

MARY GRANT (138), brig, coaster, dragged anchors and went ashore in heavy SE. weather at Belfast, July 1868. Refloated, she was wrecked north of Newcastle, 26 September 1878.

MARY ISABEL (307), schooner, of Sydney, became missing, September 1911.

MARY LLOYD, ketch, of Newcastle, was wrecked at Nobby's, Newcastle, May 1874.

MARY PEVERLEY (73), schooner, of Maryborough, was wrecked in 1915.

MARY SMITH (162), schooner, was wrecked at Fremantle, December 1890.

MARYTS, of London, was wrecked in Torres Strait, 10 August 1842.

MARY WARNER (65), schooner, foundered off Kiola, Bateman's Bay, 23 April 1894.

MARY WILSON, brig, from Oporto to Sydney, ran ashore on Gabo Island, 1 September 1852.

MATADOR (249), barque, of Melbourne, was wrecked at Bulli, 7 September 1867, during a SE. gale.

MATILDA (42), schooner, of Sydney, was wrecked between Macleay River and Sydney during SE. gale, probably on 11 January 1873, with loss of all (7) hands.

MATILDA, schooner, was wrecked at Bellinger River in 1844.

MATILDA ANN, was lost in 1849.

MAUD (25), pearling lugger, was wrecked at Cossack Creek, Western Australia, 9 January 1894, during a hurricane. Several lives were lost.

MAUDE WESTON (130), s.s., from Newcastle to Sydney, was wrecked near Terrigal Head, 11 November 1904. She sprang a leak and sank while running for shore. All hands were saved.

MAY BYRNES (212), schooner, of Newcastle, was wrecked in Port Jackson, February 1901.

MAYFIELD, 4-masted barque, left Geelong for Queenstown with wheat, February 1905, and was wrecked in Bass Strait. The crew reached Launceston safely.

MAYFLOWER (277), brig, of Adelaide, was wrecked at Augusta, July 1880.

MAYFLOWER (149), schooner, of Sydney, was abandoned off Maryborough, September 1886. She had been previously stranded off Lady Elliott Island, 27 June 1886. The mate's certificate was suspended for two years for negligent navigation.

MAY JENNINGS (61), schooner, became missing in Bass Strait, August 1890.

MAY NEWTON (214), schooner, foundered on the Tasmanian coast, December 1892.

MAYPOLE, schooner, was wrecked at King Island in 1855. 3 lives were lost.

MECCA, s.s., was wrecked in Torres Strait, 24 December 1878.

MEDEA (423), barque, of Melbourne, was wrecked in Hobson's Bay, Port Phillip, September 1880.

MEEINDERRY, s.s., collided with s.s. *Wallsend* off Red Head and sank inside southern breakwater, Newcastle, 23 May 1922. She was refloated about two weeks later.

MEG MERRILIES (143), brigantine, of Sydney, was wrecked at Cape Melville, Queensland, June 1899. Also see Section III.

MELANIE, schooner, Queensland labour vessel, was captured in 1873 by H.M.S. *Basilisk* with 55 kidnapped natives aboard. She was condemned in Sydney, but released later, as the natives had been kidnapped just before the Kidnapping Act was passed.

MELBOURNE, s.s., was wrecked, 10 November 1859.

MELBOURNE (491), barque, of Melbourne, was condemned as unfit for sea service in 1877.

MELVILLE (11), lugger, was wrecked at Melville Island, January 1917, during a hurricane.

ME MEL (110), paddle steamer, Balmain ferry, was sunk near her wharf in Darling Harbour, Port Jackson, by collision, January 1914. She was refloated a few days later. No lives were lost.

MEMENTO (464), barque, of Newcastle, was wrecked at Foster Island, Tasmania, November 1877, several lives being lost.

MERCHANT (1059), ship, of Melbourne, was wrecked at Cardwell, March 1878.

MERCHANTMAN, brigantine, was lost on Bumbora Rock, Port Hacking, 16 September 1882. The master and mate were blamed for careless navigation.

MERCURY, ketch, was damaged by collision with s.s. *Euro*, 19 June 1878, in South Australia.

MERKSWORTH, s.s., foundered in Stockton Bight, Newcastle, 7 May 1898, during heavy SE. gale; 9 of the crew were drowned.

MERMAID (84), government schooner, was wrecked on a reef to the east of Frankland Island, on voyage from Sydney to Port Raffles, October 1829. All hands were saved. She was the wretched little vessel in which Captain P. P. King did fine surveying work from 1817 to 1820.

MERMAID (37), s.s., was wrecked on Seal Rocks, October 1899, with no loss of life.

MEROPE, whaler, was wrecked in Perth Roads, 28 January 1845, in a heavy gale, during which her cables parted and she stranded on Parmelia Bank. She was afterwards refloated.

MEROPE (311), barque, of Fremantle, was wrecked at Portland in 1853.

MESSENGER, schooner, was lost on Long Reef, near Manly, February 1860.

METEOR (22), s.s., foundered on the Tasmanian coast, April 1893.

MILDURA (1394), s.s., of Brisbane, bound from Cambridge Gulf to Fremantle with cattle, was wrecked during bad weather on North-west Cape, 12 March 1907. No lives were lost, but all cattle perished. Several unsuccessful attempts were made to refloat her.

MILLEWA, ketch, was lost through missing stays and dragging anchor while getting into Kiama, July 1878.

MILTON BADGER (177), schooner, was wrecked on South Spit, Macleay River, while attempting to go to sea, 11 June 1877.

MIMOSA, s.s., was wrecked on Mimosa Rock, off Bunga Head, 15 October 1863. 2 lives were lost.

MINA (258), brig, was abandoned and wrecked between Cape Howe and Green Cape, 23 June 1888. She was abandoned because of damage sustained in heavy weather.

MINDANAS (426), barque, of Sydney, was wrecked in 1875.

MINIMBAH (221), s.s., foundered on the breakwater of Manning River, 13 April 1910, with one life lost.

MINNIE (162), brigantine, was wrecked off Weary Bay, May 1887.

MINNIE CARMICHEL, barque, stranded off Flinders Island, Bass Strait, 13 July 1884, having struck an uncharted rock.

MINNIE YOUNG (138), schooner, of Sydney, left Newcastle for Townsville and foundered on the coast of Queensland, October 1892. All hands (8) were lost.

MINORA (249), brig, of Newcastle, foundered near Broken Bay, 3 January 1898. 6 lives were lost.

MINX (34), s.s., of Launceston, foundered on the coast of Tasmania, February 1894, during a southerly gale.

MIRANDA (40), schooner, was lost in Apollo Bay, 16 August 1881.

MIRO (17), s.s., of Sydney, was wrecked in Torres Strait, August 1911.

MOA (15), pearl lugger, was wrecked near Broome in 1915.

MOKAU (113), s.s., of Sydney, was wrecked at Sussex Inlet, January 1922.

MO LHENNON (15), pearl lugger, of Fremantle, was wrecked, May 1914.

MONARCH (98), schooner, was wrecked at Wardang Island, April 1909.

MONARO (302), s.s., of Sydney, was wrecked at Moruya, May 1879.

MONEYNICK (269), barque, of Auckland, is supposed to have been wrecked off the Australian coast, July 1876. She became missing with all hands.

MONITER, cutter, was lost on the New South Wales coast, January 1834.

MONTEBELLO (1725), French barque, from Hobart for Port Adelaide, was wrecked on Kangaroo Island, 7 November 1906. All hands were saved.

MONUMENTAL CITY (768), screw s.s., barque-rigged, was lost in Malacoutta Inlet, near Gabo Island, 15 May 1853, while on voyage from Melbourne to Sydney, with 33 lives lost. She was the first s.s. to cross the Pacific from San Francisco to Sydney, which she did in 65 days, February to April 1853.

MOORESFOOT, ship, stranded at Port Phillip Entrance in 1856.

MORAVIAN (996), Aberdeen White Star clipper ship, sold to Ives of Sydney, was converted into a hulk and broken up at Sydney in 1895.

MORNING LIGHT (1713), Californian clipper ship, was destroyed by fire in 1856.

MORNING LIGHT (21), ketch, of Launceston, was wrecked at Davidson Bay, Tasmania, January 1895.

MORNING STAR, was lost off Quoin Rock, Weymouth Bay, about 1819.

MORNING STAR, ketch, was lost on Cabbage Tree Island, near Port Stephens, 28 April 1877.

MOSES FLETCHER (42), ketch, was wrecked at Moruya Heads, June 1891.

MOUNTAIN MAID (160), brig, of Melbourne, sank in collision in Port Phillip, September 1854.

MOUNT ELLIOTT (356), barge, of Melbourne, foundered at Townsville, in 1919.

MOUNT MACEDON (1539), ship, was converted into a hulk at Melbourne in 1891.

MURRAY (200), paddle steamer, struck a reef off Wallaby Point, became leaky, and in attempting to enter Manning River was wrecked, February 1886. She was navigated too close inshore.

MURWILLUMBAH (30), s.s., was wrecked at Tweed Heads, January 1911.

MUSCOOTA (2569), 4-masted ship, owned in U.S.A., formerly named *Flying Cloud*, *Muscoota*, *Ottawa*, *Bertha*, and *Buckingham*, built in 1888 at Liverpool, was damaged by collision with Norwegian s.s. *Yarra* off Cape Howe, December 1922, and proceeded to Sydney, where she was eventually converted into a hulk.

MYALL, schooner, was abandoned off Newcastle, March 1880. There was no evidence against the master.

MYNORA, s.s., from Moruya to Sydney, was wrecked on St. George's Head, 6 April 1864. No lives were lost.

MYOLA (260), s.s., foundered off Long Reef, near Manly, 2 April 1919. 4 lives were lost.

MYRTLE (167), brigantine, was wrecked on Great Barrier Reef, September 1897, near Cape Flattery.

MYSTERY (32), ketch, was wrecked on the coast of New South Wales, July 1892.

MYTH (31), cutter, of Fremantle, was wrecked off Western Australia in 1910.

NANCY, cutter, was lost at Macleay River in 1839.

NANCY, schooner, foundered with loss of all hands, 9 May 1869, in SE. gale off Newcastle.

NAPIER, s.s., of Melbourne, was lost at Port Campbell, 16 September 1878.

NARARA (48), s.s., foundered at Barranjuey, 29 May 1909.

NAROOMA (56), s.s., was wrecked at Boat Harbour, north of Broken Bay, 4 February 1909, during heavy weather.

NATAL, barque, was wrecked at Sealers Cove, Wilson's Promontory, 11 July 1865.

NATAL QUEEN (202), barque, of Hobart, was wrecked at Adventure Bay, June 1909.

NATIVE. See *Maid of the Mill*.

NAUTILUS (166), barque, of Sydney, was wrecked at Nobby's, Newcastle, 20 December 1868.

NAUTILUS (12), pearl lugger, was wrecked at Broome, 19 November 1910, during a hurricane. Several lives were lost.

NAVAL BRIGADE (554), barque, was wrecked on Frankland Island, while bound from Townsville to Java, 1 August 1875. All were saved.

NELL, s.s., was lost at Gabo Island, 1 November 1883, through not being properly found in anchors and cables.

NELSON, s.s., stranded near Cape Otway, 18 April 1878. She was also in collision with s.s. *Julia Percy* off Cape Otway, 25 December 1881.

NELSON (344), s.s., was wrecked at Tamar River, Tasmania, June 1890.

NELSON, H.M.S., launched in 1814, presented to the Victorian government, arrived at Port Phillip in 1868, and was sold to be broken up in 1898. She was brought to Sydney and cut down to a coal hulk. She was originally a 120-gun ship.

NELSON (90), s.s., of Townsville, was wrecked off Burnett Heads, January 1919.

NEMESIS (886), s.s., foundered off Cronulla while proceeding south against heavy southerly gale, 10 July 1904. All hands (21) were lost.

NENE VALLEY (333), ship, from London to Portland, Victoria, was lost on Cape Northumberland about 1860.

NEPTUNE (221), schooner, was wrecked at Pearl Point, Victoria, February 1889.

NERONG (132), s.s., sank off Norah Head during a heavy SE. gale in the afternoon of 19 September 1917. The crew in a boat were rescued by s.s. *Canonbar* during the night. 3 died from exposure.

NETHERBY, emigrant ship, bound to Brisbane, was wrecked at King Island, 18 July 1866. All (450) were saved and provided for by lighthouse keepers of Wickham until assistance arrived.

NEVA (837), convict ship from Cork for Sydney, was wrecked near Cape Wickham, King Island, on 14 May 1835. She carried 240 people, of whom 205 were convict women and children. Only 22 people got ashore, 7 dying shortly afterwards. The 15 survivors met with shipwrecked crew of the *Tartar* (q.v.) and were rescued from off the island a month later. The wreck occurred at 4 a.m. during a strong westerly gale with heavy sea which smashed the ship to pieces within 3 hours of striking the rocks.

NEWCASTLE, was lost near Hunter River in 1826.

NEWCASTLE (1137), ship, built in 1859 for Green's Blackwall Line, was lost off the Queensland coast near Torres Strait, May 1883. From 1869 to 1882 she was trading from London to Australia, was then sold to Sydney firm for conversion to a hulk, but was wrecked while going to her station.

NEW ENGLAND (360), s.s., stranded at Clarence River, 28 May 1875, and was refloated shortly afterwards. She was wrecked at Clarence River in 1883. Several lives were lost.

NEWFIELD, barque, bound for Brisbane, was lost off Port Campbell, 28 August 1892. 11 of the crew were drowned.

NEW GUINEA (1700), s.s., was wrecked at Disaster Bay, 13 February 1911. No lives were lost.

NEW MOON, s.s., was lost on voyage from Macleay River to Sydney, near Port Stephens, 1 October 1864. 10 lives were lost, 2 were saved.

NICOLAI (110), schooner, foundered on the coast of New South Wales, July 1889.

NIL DESPERANDUM, schooner, of Melbourne, foundered off Wilson's Promontory, September 1870.

NILE (164), brig, was wrecked at Kiama, 12 February 1883. No blame was attached to the master.

NO. 2 BARGE (137), of Adelaide, was wrecked in Spencer Gulf, August 1920.

NORD, s.s., was wrecked on Hippolite Rock, South East Point, Tasmania, 7 November 1915.

NORFOLK (7500), s.s., of London, became on fire and was forced to run ashore on Ninety Mile Beach, 8 November 1914. In December she broke up entirely. She had loaded in New York for Melbourne, where she discharged part of cargo and then proceeded towards Sydney, when fire broke out. No lives were lost.

NORMA (2122), 4-masted barque, while lying at anchor off Port Adelaide was run into and sunk by the ship *Ardencraig*, 21 April 1907. 1 life was lost. Shortly afterwards s.s. *Jessie Darling* hit the sunken *Norma* and sank on top of her.

NORMAN (254), brig, of Sydney, was wrecked in 1875.

NORMAN, schooner, was wrecked on Bellambi Reef, 30 August 1895.

NORMANBY, s.s., struck off Percy Island, Queensland coast, 13 August 1877, while carrying mails through Torres Strait to north-western Australia.

NORNA (89), schooner, of Sydney, was wrecked at Masthead Island in 1913.

NORSEMAN, s.s., of Rockhampton, was wrecked on Bunker Reef, March 1875.

NORTHAMPTON, ship, stranded, 20 October 1882. Inquiry was held at Sydney. There had been reckless navigation in fog.

NORTH BRITON, sloop, was wrecked on the coast of New South Wales, December 1828.

NORTHUMBERLAND, schooner, was wrecked, 7 January 1845, on Richmond River Bar. The crew landed in a boat with some effects, but while they were making another trip to the wreck, the people ashore pillaged the effects already landed.

NOTION (109), schooner, of Newcastle, was wrecked about 1870.

NOVELTY (54), cutter, of Sydney, sprang a leak and foundered off Barranjuey, February 1897.

NOVELTY (94), s.s., was wrecked at the entrance to Lake Macquarie, 17 June 1914.

NOWRA (50), schooner, was wrecked off London Bridge Rocks, near Sorrento, Port Phillip, July 1891.

NUBEENA (93), s.s., was wrecked at Frederick Henry Bay in 1913.

NUGAREA (100), schooner, was wrecked on Buccaneer Rock, Broome, January 1917.

NUT BROWN MAID (35), schooner, of Melbourne, became missing with all hands, September 1853.

NYORA (306), s.s., foundered off Cape Nelson, July 1917.

OAK HILL (590), hulk, of Sydney, was broken up, August 1919.

OAKLAND (228), s.s., was wrecked off Port Stephens, on Cabbage Tree Island, in heavy SE. gale, 26 May 1903. 11 lives were lost. One boat with exhausted survivors was picked up next day in a high sea by s.s. *Bellinger*.

OBERLIN (242), brig, of Adelaide, was wrecked at Hogan Island, Bass Strait, January 1875.

OBERON (43), yacht, sailed from England to Sydney in 1850, and went in 1851 to Solomon Islands to look for the *Ben Boyd*. She was wrecked in 1872.

OCEAN (189), brig, of Sydney, was wrecked in 1872.

OCEANA (25), s.s., foundered at Manning River, 7 September 1903.

OCEAN BRIDE (261), brig, of Melbourne, on voyage from Melbourne to Adelaide sprang a leak and was beached at King Island, July 1871. No lives were lost.

OCEAN BRIDE, schooner, was lost at the entrance to Richmond River, 20 May 1881.

OCEAN CHIEF, was wrecked in Keppel Bay in 1863.

OCEAN QUEEN, Launceston to Bali, was lost on Abrolhos, 14 September 1840, with the crew saved.

OCEAN QUEEN, brigantine, was lost on Bellambi Reef, January 1860.

OCEAN QUEEN (121), brig, of Sydney, was wrecked in 1872.

OCTOROON, schooner, foundered at sea between Port Macquarie and Sydney, March 1878.

OFFLEY (376), barque, of Hobart, was wrecked at Recherche Bay, 25 April 1880. She should have let go another anchor.

OIMARA, barque, was wrecked at Morna Point, 27 September 1903.

OLGA, Government motor launch, was destroyed by fire when 35 miles from Darwin, on 2 September 1926. No lives were lost.

OLIVER CUTTS (719), barque, of Sydney, was wrecked in 1869.

OLIVIA DAVIS, barque, was wrecked at Warrnambool, 7 May 1882, through stress of weather.

OMAGH (326), barque, struck a reef off Sea Elephant Rock and foundered off King Island, August 1868, through error in keeping too close to the reef. No lives were lost.

OMEO (789), iron barque, of Melbourne. Was originally a steamship, built in 1858. She was finally converted into a hulk and was wrecked at Bass in Western Port.

ONTARIO, ship, was wrecked by striking Corsair Rock at Port Phillip Heads, November 1853. The pilot was dismissed from service for not having boarded her, so that the master was bringing her in.

ORIZARA (6000), Orient Line R.M.S., struck shoals in thick haze caused by bush-fires off Garden Island, Fremantle, when making Fremantle from London, 17 February 1905. She became a wreck. No lives were lost.

ORONTES, ship, was lost on Orontes Reef near Port Essington, December 1838.

OSCAR (300), German barque, missed stays and was wrecked at North Head, Sydney, 12 September 1873. The crew were saved.

OSMANLI, s.s., was lost on Osmanli Reef, off Tinline Point, Kangaroo Island, November 1854, owing to a mistake of some 25 miles in her reckoning, and mistaking the land at night.

OSPREY, 3-masted schooner, was wrecked in Loutit Bay, near Cape Otway, 11 June 1854.

OSPREY (73), schooner, of Sydney, was wrecked in 1873.

OTUS, coastal s.s., sprang a leak and was beached at Cape Hawke, 17 January 1923. She became a total wreck, but without loss of life.

OUR JACK (152), s.s., sank off Manning River, 25 June 1921. 5 lives were lost, but several saved by the gallantry of men aboard s.s. *Brundah*, in a SE. gale with heavy sea.

OUR OWN, s.s., was wrecked on Bass Point, New South Wales, September 1880. No blame was attached.

PACIFIC (149), s.s., was wrecked at Llewellyn Reef, Capricorn group, in 1904.

PALERMO (133), brig, of Sydney, became missing about 1881.

PALMERSTON, s.s., stranded near Bolingbroke Point, Spencer Gulf, 19 February 1887, through neglect in not using the lead.

PANAMA, whaler, owned by R. Towns, foundered in 1858.

PANAMA (414), barque, was wrecked at the northern end of Fraser Island, 18 March 1864, with one life lost.

PANDORA, coaster, was wrecked at Port Stephens, January 1836.

PAREORA (355), s.s., of Hobart, was wrecked at Althorpe Island in 1919. 2 lives were lost in struggle through the breakers.

PARIS (77), schooner, left Cape Hawke, 3 February 1912, and was not seen again. She is, however, supposed to have been seen floating bottom up near Catherine Hill Bay, 8 February 1912. 5 lives were lost.

PARMELIA (449), ship, conveying colonists from London to Western Australia, grounded in Cockburn Sound, June 1829, was refloated, but was so damaged that she was not fully repaired until August.

PAULINE (21), ketch, of Launceston, was wrecked on Horse Shoe Reef, Western Australia, July 1889.

PAYNESVILLE (41), paddle s.s., was wrecked on Ninety Mile Beach, Victoria, 20 March 1881.

P.C.E. (291), barque, of Newcastle, was wrecked at Port Macquarie, June 1875.

PEAHEN, ketch, was lost in 1878 in a gale by driving from her anchorage in Broken Bay.

PEARL (30), schooner, of Fremantle, foundered at Roebuck Bay, February 1891.

PEARL (65), schooner, of Sydney, was wrecked off north-western Australia, October 1892.

PEARL (80), ketch, of Launceston, was wrecked at Tam o' Shanter Bay, Tasmania, July 1894.

PEARL, s.s., sank south of Brisbane, 13 January 1896. 20 lives were lost.

PEARL, s.s., foundered at Clarence River, 27 June 1912, with one life lost.

PEARLING LUGGERS are small craft of from 10 to 20 tons, carrying about 8 men, engaged in pearling or bêche-de-mer fishing. Numbers have been lost in storms, principally on the coast of west, north-west, and north Australia. Many of their names are recorded in this Section 11. Some of the storms, variously known as hurricanes, cyclones, willy-willies, and cock-eyes, which have caused serious loss of lives and luggers, are recorded in Bulletin No. 16, published by the Commonwealth bureau of meteorology, from which the following are extracted.

WESTERN AUSTRALIA.

1870, 25 Dec., near Roebourne, 4 luggers sank.
1875, 24 Dec., off NW. coast, several wrecked. 59 lives lost.
1879, 24 Jan., near Broome, 2 luggers lost.
1880, 9 Jan., off Yammandery Banks, 1 lugger lost.
1881, 7 Jan., near Roebourne, many lost.
1883, 8 Feb., near Roebourne, two lost.
1887, 10 Jan., near Port Hedland, several lost, also 5 lives.
1887, 22 April, near Wallal, 18 lost and 140 men drowned.
1889, 6 Feb., in King Sound, several wrecked.
1889, 1 Mar., near Roebourne, 3 lost with several lives.
1893, 25 Mar., near Roebourne and Onslow, 15 lost, with 20 lives.
1894, 9 Jan., near Roebourne and Onslow, many lost, with 40 lives.
1898, 2 April, at Cossack, all luggers in the creek were lost.

1904, 17 April, near Broome, schooner wrecked.
1905, 8 Feb., near Onslow, shipping damaged, with loss of life.
1908, 26-27 April, near Broome, pearling fleet wrecked and 50 lives lost.
1908, 9 Dec., near Broome, 50 lives lost.
1909, 6 April, near Onslow, 4 luggers and 24 men lost.
1910, 19 Nov., near Broome, 26 lost and 40 lives.
1911, 7 Feb., near Onslow, one vessel wrecked, with only 1 survivor.
1912, 16 to 21 March, near Cossack, *Koombana* was lost in this storm.
1920, 15 April, near Condon, 2 luggers lost.
1921, 18 Feb., near Shark Bay, damage to fishing fleet.
1923, 8 Mar., near Wallal, 2 luggers lost.

NORTHERN AUSTRALIA.

1897, 6 Jan., near Darwin, numbers of vessels and many lives lost.
1912, 13 to 21 Mar., NW. coast from Darwin, 1 vessel wrecked.
1915, 25 Feb., near Melville Island, several lives lost.
1917, 1 April, near Darwin, several lives lost.
1922, 11 to 15 Mar., on NW. coast, motor-boat sank with loss of life.
1923, 23 March to 9 April, in Gulf of Carpentaria, s.s. *Douglas Mawson* lost with all hands.

EAST COAST OF QUEENSLAND

Comparatively little pearl fishing has been carried on here, therefore losses of pearl luggers have been few on this coast, with the great exception of almost the whole pearling fleet destroyed in Bathurst Bay, 5 March 1899, with the loss of about 350 lives.

PEERLESS, ketch, was wrecked at King Island in 1878.

PELICAN (44), paddle steamer, of Sydney, foundered at Nambucca Heads, April 1888.

PELORUS, H.M., brig, was wrecked at Port Essington, 25 November 1839. 9 lives were lost. She parted her cables at midnight in a hurricane and drove ashore. Some of the crew swam ashore next day, and others were rescued by H.M.S. *Britomart*. The crew remained by the wreck until, after 16 months, they partially repaired her and sailed to Coupang and thence to Singapore.

PENDLE HILL, brigantine, was wrecked on Cockburn Reef, near Cooktown, 9 May 1884, while being navigated at night in squally weather.

PEONY (388), barque, of Newcastle, was wrecked near Richmond River, March 1877. 5 lives were lost and 5 saved. She sprang a leak and her pumps became disabled.

PERICLES (11,400), s.s., Aberdeen White Star Line, bound for London, struck on rocks off Cape Leeuwin and sank during a fine afternoon, 30 March 1910. All passengers and crew were landed safely in boats near lighthouse.

PERSEVERANCE, s.s., of Sydney, was wrecked on rocks near Point Danger, Tweed River, 14 April 1870.

PERSEVERANCE (21), schooner, of Melbourne, was wrecked at Western Port, September 1874.

PERSEVERANCE, brigantine, of Sydney, stranded on North Head, Sydney, 15 May 1877. The master was severely reprimanded for not taking necessary precautions.

PERTH (170), s.s., of Adelaide, was wrecked at Point Cloaks, Western Australia, September 1887.

PETERBOROUGH. See *Prince of Wales* (1886).

PETREL, was lost on Queensland coast in December 1873. Several lives were lost.

PETREL (60), ketch, of Sydney, was wrecked on Bellinger River Bar, March 1896.

PETRIANA (1672), s.s., of London, was wrecked at Point Nepean, 28 November 1903.

PHANTOM (19), ketch, of Launceston, was wrecked at Stonehouse Island, February 1894.

PHANTOM (31), auxiliary ketch, was wrecked at Frederick Henry Bay, 1 January 1915.

PHIL FORBES (87), ketch, of Sydney, foundered near Broughton Island, 5 June 1922. No lives were lost.

PHILIP PALFREY (96), schooner, was wrecked at Trial Bay, May 1898.

PHILIPPINE, barque, stranded in Antechamber Bay, Kangaroo Island, 29 September 1882, having anchored too close inshore.

PHOEBE, schooner, was piratically seized at Shoalhaven in 1827.

PHOEBE (14), pearl lugger, was wrecked at Broome, Western Australia, 19 November 1910, during a hurricane. Several lives were lost.

PHOEBE DUNBAR (704), clipper ship, was destroyed by fire at Newcastle, 7 March 1864. She was stranded near Amity Point when making Moreton Bay in May 1856, and almost wrecked, but was refloated and repaired in Sydney, August 1856.

PHOENIX (212), s.s., built in 1846, was wrecked in a heavy gale at the Clarence River on 3 March 1850. She was refloated, repaired, and finally totally wrecked there on 14 April 1852. No lives were lost.

PHOENIX, paddle s.s., was wrecked on Ipili Reef in Prince of Wales Channel, Torres Strait, when bound from Sydney to Singapore, 8 July 1855. No lives were lost.

PHOENIX (1587), American ship, became on fire in Hobson's Bay, Melbourne, 28 February 1860. She was scuttled and sank in 25 feet of water, but was refloated later.

PILOT (26), s.s., sank in Hobson's Bay, Melbourne, March 1893.

PILOT, government steam ketch, was wrecked near Cape Flattery during a hurricane, December 1906. All hands (6) were lost.

PILOT BOAT of Port Jackson, went off to ship *Strathdon*, and capsized; the butcher's boat picked up all hands, then filled with water and sank; two other pilot boats came out, one sank; the other rescued survivors, 20 July 1867. 8 lives were lost.

PIONEER (148), brig, was lost on Cockburn Reef while going to Torres Strait, 22 May 1851.

PIONEER, s.s., was wrecked at Cronulla in 1853.

PIONEER, s.s., stranded at Circular Head, May 1870.

PIONEER (38), ketch, of Sydney, was lost off Botany Bay in 1875.

PIONEER (33), s.s., of Adelaide, was wrecked on Cronulla Beach, 27 June 1875.

PIONEER (15), schooner, of Launceston, was burnt in the Tamar River, Launceston, January 1875.

PIONEER, s.s., stranded on Cronulla Reef, 21 April 1883, through careless navigation and premature abandonment.

PIONEER (62), was wrecked on the western coast of Tasmania in 1893.

PIRRA, lighter, was burnt at Perth, 20 March 1907, with a large amount of cargo aboard.

PLANET, barque, stranded near Fremantle, 4 June 1880, through keeping no watch when at anchor at night.

PLANET, schooner, stranded on De Lembre Reef, 15 July 1881, through negligent navigation.

PLANET (65), schooner, was wrecked at Dongarra, July 1890.

PLANTER (263), barque, of Adelaide, was wrecked at Flinders Island, Bass Strait, 15 June 1877, through error of judgment.

PLATYPUS, s.s., was wrecked while entering Richmond River, April 1878.

PLUTUS, s.s., was lost near Beecroft Head, 9 December 1882, through careless navigation.

POLLY, s.s., was wrecked near the pilot station, Moreton Island, in 1880. The master was censured.

POLLY (89), s.s., sank at Johnstone River, November 1889.

POLLY HOPKINS (59), brigantine, of Sydney, is supposed to have been wrecked between Newcastle and Sydney about 11 January 1873 during heavy SE. gale. All (7) hands were lost.

POLONAISE, was wrecked off Masthead Island, Capricorn group, 4 February 1873, with no lives lost.

POLYPE (10), pearl lugger, was wrecked at Port Keats, January 1913, during very bad weather.

PORT JACKSON, s.s., was burnt at Central Wharf, Sydney, 25 May 1893.

PORT JACKSON (53), tug, drifted and was wrecked on Norah Head, 12 February 1910.

PORTLAND, schooner, was wrecked on a reef off Point Lonsdale, 15 September 1852. No lives were lost. A few hours later her light was mistaken for the leading light and caused the wreck of s.s. *Conside*.

PORT LYTTELTON (6444), s.s., Commonwealth and Dominion Line, stranded near Tamar Heads, 23 January 1925, proceeded to Sydney for repairs, but was held up by labour troubles for nearly four months. She was then temporarily repaired and went to Batavia, where she was sold to Italy.

PORT MACQUARIE, schooner, was wrecked on the Tasmanian coast in 1835.

PORTMAISE, stranded on Masthead Island, Capricorn group, 2 February 1872.

PORT PATRICK, ship, was abandoned off Cliffy Island, near Wilson's Promontory, 14 January 1902. She was picked up and towed to Sydney with great difficulty.

PORT STEPHENS, stranded at Norah Head, 4 November 1911.

PORT STEPHENS (51), ketch, was burnt at Broadmount in 1913.

POSSUM (21), s.s., foundered at Hastings River in 1911.

POST BOY, schooner, was wrecked off South Australia, with loss of all 6 hands, 16 December 1876.

PREMIER (114), ketch, was wrecked at Nambucca Heads, May 1916, during a southerly gale.

PRESTO (394), barque, of Melbourne, was lost, May 1901.

PRETTY JANE (101), s.s., of Melbourne, was wrecked on Ninety Mile Beach, Victoria, May 1882. She was beached to save life. The master was exonerated.

PRIMA DONNA, ketch, left McDonnell Bay in 1880 for Adelaide and is supposed to have foundered at sea with all hands.

PRIMA DONNA, schooner, was lost off Bondi, near Sydney, capsizing in heavy squall, 29 March 1882.

PRIMO, brig, foundered eighty-five miles south-east of Port Jackson, 24 January 1857.

PRINCE ALFRED (56), ketch, foundered off Wollongong, June 1891.

PRINCE CHARLIE, struck on Prince Charlie Shoal, off Peron Peninsula, about 1850.

PRINCE CONSORT (1236), ship, when bound from Brisbane to Newcastle was driven down the coast close into Cronulla, where she anchored on 12 June 1864. Her masts were cut away and the crew abandoned her, but a few days later she was towed to Sydney by s.s. *Kembla*.

PRINCE GEORGE (49), formerly a revenue cutter, was lost off Wollongong, 20 March 1846. She arrived from England at Sydney in 1833, and was there sold and became a trader.

PRINCE OF WALES, brig, capsized off Cape Howe, June 1853; her cable then ran out and anchored her bottom upwards, in which position she remained for a week or two before sinking.

PRINCE OF WALES, ship, was wrecked on Point Nepean in 1858.

PRINCE OF WALES, s.s., A.S.N. Co., was wrecked on Mermaid Reef, between Tacking Point and Crowdy Head, 4 October 1862.

PRINCE OF WALES (238), schooner, of Sydney, was wrecked at Port Macdonnell, June 1873.

PRINCE OF WALES (114), brigantine, of Melbourne, became missing in 1876.

PRINCE OF WALES, sank in collision with the *Peterborough* off Sydney Heads, 16 July 1886.

PRINCE PATRICK (150), schooner, after collision with brig *Drover* inside Sydney Heads, 17 December 1869, was wrecked on the rocks at North Head in calm weather.

PRINCE REGENT, ship, ran ashore on reefs east of Barnard Island in 1827.

PRINCE VICTOR (294), barque, of Melbourne, was justifiably abandoned at sea in a sinking condition, 25 September 1881.

PRINCESS, small government s.s., was sunk in collision with Newcastle tug *Awhina* in Sydney Harbour, 18 December 1894, while leaving Chowder Bay with a private picnic party of children. She sank in shallow water a few minutes after. 2 children were drowned, and 2 more died a few hours later. She was raised next day.

PRINCESS LOUISE (90), schooner, was wrecked at Lizard Island, March 1888.

PRINCESS ROYAL, barque, of Liverpool, was lost on Point Lonsdale, 24 February 1849, through the light having been moved from its proper position and placed where it could not be seen by vessels making entrance. No lives were lost. She was on voyage from China.

PRINCESS VICTORIA, ship, was blown up on the Australian coast about 1853.

PRINCEZA (141), brig, was wrecked in Rous Channel, south of Moreton Island, 15 March 1863.

PROMISE (31), ketch, was wrecked at Port Sorell, May 1891.

PROSPECTOR, was run into and sunk by *Ajax* while loading at Newcastle, 2 May 1884.

PROSPER COLON, schooner, stranded through missing stays while beating into Port Hacking, October 1879. The master was censured for going to sea without a windlass. She was wrecked on Bellinger River Bar, 14 May 1884, owing to insufficient power of the steam drogher which attempted to tow her to sea.

PROSPERITY, brig, was blown up by coal explosion in Neutral Bay, Sydney, 20 February 1895.

PROSPERITY (125), brigantine, of Sydney, was wrecked at Stradbroke Island, 15 February 1902.

PROTECTOR, barque, of Bristol, was burnt in Hobson's Bay, Melbourne, 12 September 1853.

PROTECTOR, steam tug, was totally lost at Richmond River Heads, 1 July 1901, with all 6 hands.

PROVIDENCE (62), paddle steamer, of Adelaide, was wrecked, 9 November 1872, through her boiler bursting on Murray River. 4 lives were lost.

PSYCHE, late H.M.S., was sold in 1923 after being dismantled. She was taken to Port Stephens to be used as a hulk, and there sank at her moorings, December 1924.

PYRAMUS, took the first government surveyors to Port Phillip to lay out Melbourne and Geelong. For several years she was used as a hulk in Sydney Cove, and was broken up in 1844.

PYRMONT, s.s., bumped heavily on Manning River Bar and was wrecked, 6 August 1909, with one life lost.

QUEEN BEE (70), s.s., of Sydney, foundered off Broken Bay, September 1922.

QUEEN OF NATIONS (872), Aberdeen White Star wooden clipper ship, on voyage from England to Sydney was wrecked near Wollongong, 31 May 1881, through careless navigation. One life was lost.

QUEEN OF THE SEA (322), barque, of Hobart, was wrecked at Eddystone Point, August 1877.

QUEEN OF THE SOUTH (376), barque, of Lyttelton, was wrecked off Tasmania, November 1877.

QUEENSCLIFFE, s.s., stranded on Anonyma Shoal, Port Phillip, 9 February 1884, with one man drowned. She was going at full speed during fog.

QUEENSLAND, s.s., Eastern and Australian Co., sank after collision with s.s. *Barrabool* off Wilson's Promontory, 3 August 1876, with one life lost.

QUEENSLAND (414), barque, of Newcastle, became missing, February 1879.

QUETTA, British India s.s., Brisbane to London, struck a submerged rock and sank in Adolphus Channel near Torres Strait, 28 February 1890, with 134 lives lost. She ripped her bottom out and sank in a few minutes. There were 150 survivors, including only 2 women.

RACHEL COHEN, was lost at Port McDonnell, June 1877, through her mooring chains breaking.

RAINBOW, s.s., was lost in Seal Rocks Bay in a heavy gale, 2 June 1864, 7 lives being lost, 9 saved.

RAMORNIE, s.s., foundered at Grafton, 31 January 1893.

RANELAGH (836), s.s., was wrecked at Bundaberg, January 1898.

RANGER (88), schooner, was wrecked on Stockton Beach, Newcastle, June 1891, during heavy SE. sea.

RANGOON (374), barque, of Melbourne, was wrecked near Kiama, 22 March 1870, being driven ashore by an easterly gale.

RAVEN (80), s.s., was wrecked near entrance to Macleay River in 1850, but her hull was repaired and used as a lighter in Newcastle harbour for many years.

RAVEN (116), schooner, was wrecked near Crowdy Head, New South Wales, 15 February 1868, during a heavy SE. gale.

RAVEN (344), barque, of Adelaide, was wrecked on Dyer's Island, Western Australia, March 1891.

REAPER, schooner, from Richmond River, was wrecked off Bellambi, June 1864.

REBECCA, was wrecked at King Island in 1843, with one life lost.

REBECCA, barque, from London to Sydney, was wrecked on the western coast of Tasmania, 29 April 1853. Many lives were lost.

REBECCA (115), brigantine, of Sydney, was wrecked at Broken Bay, October 1878.

REBECCA JANE (219), brig, of Melbourne, was wrecked at Halifax Bay, Queensland, July 1880.

RECORD (463), barque, of Newcastle, was wrecked in 1875.

RED ROVER, schooner, was wrecked at Broulee, near Moruya in 1841.

REGENT BIRD (19), schooner, of Sydney, foundered in Torres Strait, February 1891.

REGENT MURRAY (849), barque, of Glasgow, was wrecked on Oyster Bank, Newcastle, 4 April 1899, in SE. gale.

RELIANCE, schooner, was abandoned off Tweed River, 21 July 1887, in a sinking condition, having sprung a leak.

RELIC (113), schooner, foundered off Eddystone Point, April 1910.

RESCUE (74), paddle s.s., grounded and became a total loss on Richmond River Bar, 9 April 1908.

RESCUE (54), schooner, was wrecked at North Turtle Island, Western Australia, May 1917.

RESOLUTE, schooner, was wrecked on rocks near Sydney Heads, 1 May 1877, in very bad weather.

RESOLUTE, schooner, was wrecked at Kingston, Lacepede Bay, 11 June 1878.

RESOLUTE, s.s., was beached in a foundering condition, in Wollongong Harbour, 13 July 1894. No lives were lost.

RESOLUTE (144), s.s., was wrecked on Bellambi Reef, 12 July 1907.

RESTLESS (258), brig, of Sydney, foundered off Solitary Island, struck by lightning, and also leaking in a heavy gale, 24 August 1872.

RESULT (1565), ship, Green's Blackwall Line, built in 1853, a well-known emigrant ship to Melbourne, was burnt in Hobson's Bay, October 1866. She was raised and floated to Williamstown, January 1868.

RESULT (724), barque, of Melbourne became missing, September 1880.

RESULT (56), schooner, was wrecked on Abraham's Bosom, near Jervis Bay, 30 September 1893, through missing stays while going about during the night.

RETRIEVER, stranded at Port Phillip Entrance in 1856.

RETRIEVER, barque, of Melbourne, stranded on a coral patch when anchored off Lacepede Islands. Inquiry was held at Amoy, 29 July 1877.

RIALTO (303), barque, of Melbourne, was wrecked on Newcastle Breakwater, 5 December 1870, during SE. gale.

RICHMOND, s.s., was lost at Port Macquarie, 21 January 1884, through small depth of water on the bar.

RIDGEPARK (618), s.s., of Adelaide, was wrecked on Beware Reef, near Cape Conran, February 1881.

RIO (312), schooner, was wrecked at King Island, 28 June 1915.

RIO CLARA (4086), s.s., of London, while on a voyage from New York to Queensland, stranded on Scott Reef, 30 miles east of Cairns, on 8 September 1926. Salvage operations still in progress (25/9/26).

RIVALS, ship, was wrecked to west of Cape Bernouilli about 1840.

RIVERINA (2000), s.s., Lund's Blue Anchor Line, was wrecked near Ram Head, 27 January 1890. The master's certificate was suspended for 6 months. No lives were lost.

RIVERSDALE (1453), ship, of Newcastle, was broken up in 1917.

ROBERT SAYERS, was burnt in Darling Harbour, Sydney, in 1854.

ROBIN HOOD (284), brig, of Auckland, stranded off Hummock Island, Bass Strait, having struck near Kohinoor Rocks, 27 December 1884. No one was blamed.

ROB ROY, schooner, of Sydney, was wrecked at the mouth of Clarence River, June 1878, by reason of towrope parting.

ROB ROY (41), ketch, of Sydney, foundered on the coast of New South Wales, September 1894.

ROCKHAMPTON, barque, was wrecked off Kimberley about 1894.

ROCKINGHAM, ship, was wrecked at Rockingham, Cockburn Sound in 1830 during heavy gales, which broke her moorings.

RODERICH DHU, schooner, of Sydney, was wrecked on the New South Wales coast in heavy easterly weather, 13 July 1866.

RODNEY (133), paddle steamer, was burnt on the River Darling, August 1894.

RODONDO (715), s.s., of Sydney, was wrecked on Pollock Reef, Western Australia, 7 October 1894. No lives were lost.

ROMEO, barque, was lost between Cape Everard and Ram Head, 14 February 1882, owing to careless navigation.

ROSA, brig, from South Sea islands, was wrecked south of Macquarie lighthouse, Sydney, 11 July 1853. All hands were saved.

ROSE, ketch, was wrecked near the entrance to Tuggerah Lakes, 12 May 1877, through the master's incompetence.

ROSE (29), s.s., was burnt at Port Stephens, October 1916.

ROSEDALE (164), s.s., is supposed to have foundered between Smoky Cape and Sydney, 11 September 1911, 26 lives being lost.

ROSE M. (366), barque, of Newcastle, foundered on the New South Wales coast, March 1891.

ROSE OF AUSTRALIA (261), brig, of Newcastle, was wrecked in a fog in Wreck Bay, January 1874. All were saved.

ROSE OF SHARON (78), s.s., stranded on Long Reef, near Manly, 28 February 1887, through neglect of proper precautions. She was wrecked at Brunswick River, February 1891.

ROSTREVOR (140), s.s., of Newcastle, was wrecked at Cape Everard, August 1919, in a southerly gale. No lives were lost.

ROTUMA (196), brigantine, was wrecked at Derwent River, September 1907.

ROVER, coaster, was wrecked near Newcastle in April 1831. All hands were lost.

ROVER, schooner, was wrecked in Newcastle Bay, November 1856. The crew were saved by the gallantry of the crew of the ship *Lord Burnleigh* in heavy gale.

ROYAL DUKE (105), brigantine, of Brisbane, was lost off Pera Head, Gulf of Carpentaria, October 1891.

ROYAL EXCHANGE (222), barque, of Newcastle, was wrecked in 1874.

ROYAL SHEPHERD (227), s.s., sank in collision at Sydney Heads, July 1890.

ROZELLE (88), schooner, was wrecked at Long Beach, near Cape Three Points, 19 October 1914, during a heavy SE. gale.

RUBY, brig, ran aground at Port Phillip Heads in 1855.

RUBY (83), schooner, was wrecked off Newcastle, 17 November 1894.

RUNNYMEDE (284), barque, of Hobart, was wrecked at Frenchman's Bay, Dampierland, 24 December 1878, during a hurricane.

SABLE CHIEF (150), schooner, was lost at Facing Island, near Port Curtis, in 1857.

SACRAMENTO, emigrant ship, was wrecked on Point Lonsdale, while hove to and waiting for daylight, to enter Port Phillip, 27 April 1853. 300 immigrants were aboard, but no lives were lost.

SAGITTA (83), schooner, of Brisbane, was wrecked at Cape Melville, March 1899.

S. A. HAYWARD (63), ketch, was wrecked at Port Stephens, March 1913, while proceeding from Camden to Sydney. She was wrecked in attempting to shelter from storm. No blame was attached.

SAINT ALBANS (64), wooden s.s., was wrecked in Long Bay, near Sydney, 17 May 1882. The master was in default for being short-handed and navigating too close inshore.

SAINT GEORGE, ship, bumped over rocks off Point Nepean, struggled into Port Phillip, and sank off Swan Island, January 1853.

SAINT GEORGE, s.s., struck Seal Rocks, 21 December 1903, but was refloated.

SAINT HELENS, ketch, was wrecked on Black Reef, Tasmania, 2 October 1880. The master was warned to be more careful.

SAINT LAWRENCE (1019), barque, of Sydney, was abandoned on the coast of Western Australia in 1889.

SAINT PAUL, s.s., was wrecked by striking Smith Rock, Cape Moreton, 27 March 1914. 18 lives were lost.

SALACIA (423), barque, of Melbourne, was wrecked, November 1876.

SALLY, government schooner, was lost at Port Macquarie, 18 April 1925.

SAMOA (163), schooner, was wrecked near Ulladulla, 12 July 1893.

SAMUEL, schooner, Sydney to Hobart, was wrecked, November 1831.

SANTA CRUZ, ketch, was abandoned off Newcastle Entrance, 19 July 1883, in consequence of the wind failing and the vessel drifting on to Oyster Bank.

SAPPHIRE (749), emigrant ship, left Sydney for Madras and was lost near Raine Island on Great Barrier Reef, 23 September 1859. The crew in 2 boats left Sir Charles Hardy Island 5 days later, and after various adventures and hardships arrived at Port Curtis, 19 February 1860.

SAPPHO, H.M.S., left England for Australia in 1858, was spoken at entrance to Bass Strait, and not again heard of. It is supposed that she capsized. She was commanded by Commander Fairfax Moresby, son of Admiral Fairfax Moresby.

SARAH, coaster, was lost at Sydney Heads, June 1838.

SARAH ANN (135), brig, of Sydney, was wrecked in 1871.

SARAH BURNYEAT, barque, stranded at Lockeville in Geographe Bay, 3 October 1879. The master's certificate was cancelled.

SARAH DENT, ketch, from Newcastle, capsized in a squall off Port Stephens and foundered with her crew of 5 men, 17 October 1863.

SARAH NICOLL (68), schooner, of Sydney, was wrecked during heavy weather near Bellinger River, 19 February 1875. All 5 hands were lost.

SARAH S. RIDGEWAY (831), U.S.A. barque, left Newcastle for Singapore in January 1895 and was wrecked on Queensland coast.

SARAH WILLIAMS, schooner of Western Australia, became missing with all hands, February 1925.

SARSFIELD (175), brigantine, was wrecked at Richmond River, March 1887.

SATARA (5272), British India s.s., bound from Sydney to India, struck Edith Breaker near Seal Rocks and sank, 20 April 1910. All hands, over 100, were saved by s.s. *Orara* and *Dorrigo*.

SAUCY JACK (156), brig, was wrecked at Coff's Harbour, 15 June 1893.

SAXONIA (243), s.s., foundered at Newcastle Entrance and was raised next month, August 1872. She was wrecked on Bellambi Reef, May 1898.

SCAMANDER, whaling ship, was lost in 1860.

SCHOMBERG (2600), wooden clipper ship, Black Ball liner, commanded by James N. Forbes (well known as commander of famous *Marco Polo*), lost on her maiden voyage from London to Melbourne, 27 December 1855. She stranded 35 miles westward of Cape Otway in practically a calm, with strong current, and broke up a few days later. No lives were lost, but Forbes lost his reputation.

SCOTIA (52), schooner, was wrecked at Kiama, December 1889.

SCOTTISH BARD, barque, stranded on Swain Reefs at the south end of Great Barrier Reef, 19 January 1879, through negligent navigation.

SEA, ship, Melbourne for London, while leaving Port

Phillip was wrecked, 7 June 1853, near Point Nepean. Several lives were lost.

SEA BELLE (155), brig, left Port Curtis for Sydney, 1 April 1857, and was wrecked on Breaksea Spit off Fraser Island. Natives killed all the white men, but kept a woman and 2 children, who were not heard of and rescued until 1859.

SEA BREEZE, ketch, was wrecked on North Head, Botany Bay, May 1883.

SEA BREEZE (48), schooner, of Sydney, was destroyed by fire at Cooktown, October 1919.

SEA FOAM (66), ketch, was wrecked at Nelson's Bay, 1 February 1894.

SEA GULL, schooner, of Sydney, was wrecked off Newcastle, 13 July 1866, in a heavy easterly gale. All hands (5) were lost.

SEA GULL (423), barque, of Adelaide, sank in collision, December 1878.

SEAGULL (120), s.s., left Port Stephens for Newcastle, sprang a leak and was beached 18 miles north of Stockton on 21 August 1926. No lives were lost.

SEA HORSE (209), in 1842 struck a rock near the mouth of the Tamar; was brought to Sydney, and remained several years in Johnston Bay; and was then used as a wharf hulk in Darling Harbour.

SEA NYMPH (169), brig, of Sydney, was wrecked about 1871.

SEA NYMPH (289), brig, sank in Sydney Harbour after collision with s.s. *Arawatta* on dark, dirty night, 8 June 1883, with no lives lost.

SEA RIPPLE (126), schooner, of Sydney, was wrecked at Port Stephens, March 1875.

SEA SPRAY (296), brig, of Newcastle, sprang a leak, was abandoned, and foundered south of Botany Bay, 11 April 1878. The master displayed no determination or energy, and the crew refused to pump.

SECRET, schooner, stranded in Providence Bay, Port Stephens, through dragging anchors in heavy SE. gale, 9 May 1869. One life was lost.

SECRET, cutter, foundered at Lakes Entrance, Victoria, August 1898.

SEESTERN (589), German New Guinea government yacht, left Brisbane for Rabaul, April 1909, and is supposed to have foundered in heavy gale a day or two later, with all hands lost. Some wreckage was recovered later.

SETTLER (281), s.s., foundered in Brisbane River, November 1885.

SETTLERS FRIEND, schooner, was lost at the entrance to Tweed River, March 1878.

S. F. MERSEY (961), hulk, of Melbourne, built in 1865, was sunk for use as a pier in 1923.

SHAH (161), schooner, was lost on the Tasmanian coast, 20 December 1837, with several lives lost.

SHAMROCK (34), ketch, was wrecked at Port Stephens, May 1889.

SHAMROCK (819), s.s., of Sydney, was wrecked at Catherine Hill Bay, 31 March 1903. No lives were lost.

SHAMROCK (21), tug, was burnt at Camden Haven, 19 February 1911.

SHANNON (94), paddle steamer, was wrecked at King Island, 9 September 1906. No lives were lost.

SHARPERTON, barque, stranded off East Lacepede Island, 20 August 1878, through careless navigation.

SIERRA NEVADA, ship, was wrecked off Port Phillip, 8 May 1900, with 25 lives lost.

SINGAPORE (964), R.M.S., was wrecked on an uncharted rock, now called Singapore Rock, south of Keswick or L.I. Island, Queensland coast, 29 January 1877, on voyage from Hong Kong to Sydney. The master was held free from blame.

SIR ARCHIBALD CAMPBELL, ship, from Sydney to Singapore, was wrecked inside Cockburn Reef, on Great Barrier Reef near Sir Charles Hardy Island, 1 June 1843. The crew were saved by H.M.S. *Bramble* and other ships.

SIR DAVID OGILBY, was lost at Newcastle, 19 September 1840.

SIR GEORGE (94), ketch, of Sydney, was wrecked near Smoky Cape, during SE. gale, on the night of 12 November 1903, 2 lives being lost.

SIR GEORGE ARTHUR, convict ship, was wrecked about 1840. The master (drowned) was drunk.

SIR HENRY HARDINGE, ship, from Sydney to Singapore, was lost near Smoky Cape, 21 June 1854, but with all hands saved.

SIR JAMSETJEE FAMILY, barque, struck on Otway Reef, 21 February 1884, while standing in too close for signalling. She was stranded again in Washington Territory, U.S.A., 24 December 1886.

SIR JOHN BYNG (187), brig, of Sydney, was wrecked at Belfast, May 1852.

SIROCCO (233), schooner, left Newcastle in 1883 and was not heard of again. All hands were lost.

SIR ROBERT PEEL, ship, was lost at Avoca Bay, near Cape Three Points, January 1847.

SIR WILLIAM WALLACE, ship, was wrecked on Acteon Reef, D'Entrecasteaux Channel, while working into Hobart about 1838.

SIR W. MOLESWORTH (468), barque, of Melbourne, was broken up in 1876.

SKERRYVORE, brig, was burnt and sunk at Sydney Heads, 18 March 1860.

SLIPPERY CHARLIE, stranded on the bar of Nambucca River, New South Wales, 12 July 1866. 12 lives were lost, 1 saved.

SNOWBIRD, schooner, of Sydney, was burnt off Cardwell, August 1869.

SOCOTRA, barque, was damaged by fire at Adelaide Wharf, Miller's Point, Sydney, 10 December 1897.

SOCRATES (152), barque, of Launceston, was wrecked at Belfast, August 1843.

SOLON (565), barque, was wrecked, 28 April 1860,

SOPHIA, of Sydney, came into collision in 1839.

SOPHIA, brig, Hobart to Melbourne, was wrecked and sank off Point Nepean, 31 May 1848. No lives were lost. Later on she drifted with the tide inside the heads and was eventually raised and repaired.

SOPHIA (200), brigantine, of Sydney, was wrecked while entering Port Jackson, 25 July 1881.

SOPHIA ANN (91), s.s., grounded on Richmond River Bar and became a total wreck, 9 April 1908. There was no loss of life.

SOPHOCLES, Aberdeen White Star s.s., left Albany for London and returned three days later to Fremantle on fire, December 1904. It became necessary to flood No. 4 hold to extinguish the fire.

SORATA, s.s., Orient Line, stranded near Cape Jervis light, 3 September 1880. Inquiry was held at Adelaide, January 1881, but it was decided that the board had no jurisdiction. She was ashore for 10 weeks, then refloated, and was repaired in Melbourne.

SOUTH AUSTRALIAN, ship, owned by South Australian company, while lying at anchor in Rosetta Harbour, Encounter Bay, during a storm in 1838, was blown on to the reef and wrecked. At the same time the schooner *John Pirie* cut her cables and, after bumping heavily, got safely over the reef and into Port Victor.

SOUTHERN CROSS (323), formerly the second Melanesian mission barque, sold to Hobart in 1874, was wrecked at Cape Douglas, South Australia, July 1880.

SOUTHERN CROSS (477), s.s., of Hobart, stranded on Wakaya Reef, April 1885, and was wrecked near Circular Head, February 1889.

SOUTHERN CROSS (291), brigantine, of Melbourne, built in 1891, became missing with all hands, September 1920. Possibly she struck Reid's Rock near Port Phillip. Portions of wreckage were found near King Island. See *Southern Cross*, fourth Melanesian mission vessel, in Section III.

SOUTHLAND (143), paddle steamer, of Newcastle, sank in collision off Newcastle, July 1876. No lives were lost.

SOUTH MILTON, barque, stranded on Charlemont Reef, Barwon Heads, 10 April 1886. The master neglected to ascertain her position when off Cape Schanck light.

SOVEREIGN (214), s.s., was wrecked, 4 March 1847, on the north bar of Rous Channel, south of Moreton Island, Queensland. 44 of the passengers and crew perished.

SOVEREIGN OF THE SEAS (1226), the second wooden clipper ship of that name, Black Ball Line, built 1856, was burnt, September 1861, while discharging at Campbell's Wharf, Sydney, and is supposed to have been maliciously set on fire. Her hull was repaired and made into the s.s. *T. S. Mort*, which was lost in 1863. See Section III.

SPEC (258), brig, of Melbourne, was wrecked at Clarke Island, Bass Strait, December 1870.

SPECULANT (363), brigantine, was wrecked off Cape Patton, 2 February 1911.

SPEEDWELL (350), barque, was wrecked at Norah Head, 14 April 1888, through carelessness.

SPEKE (2712), ship, in ballast from western coast of South America, made the coast at Sydney, proceeded to Melbourne, and was wrecked on Phillip Island, Western Port, 22 February 1906. No lives were lost.

SPERWER, the crew of 17 men were killed by natives of Prince of Wales Island, Torres Strait in 1869.

SPINDRIFT, ketch, stranded at Waterloo Bay, 22 July 1881. No blame was attached to master.

SPRAY, brig, of Sydney, was wrecked near Bulli, April 1870.

S.P.S. (18), schooner, of Fremantle, was wrecked, December 1914.

SPUNKIE (132), schooner, of Sydney, sank after collision with s.s. *Ranelagh* off Cape Moreton, 13 July 1888. *Ranelagh* was held to blame.

SPURWING (90), schooner, was wrecked at Byron Bay, July 1889.

SQUATTER, schooner, was lost at Port Fairy, May 1846.

STAG, barque, was wrecked on Vansittart Shoal, Furneaux group, Bass Strait, 1 August 1882. The master was held in default and the mate also was censured.

STAG (307), barque, was wrecked on North Head, Port Stephens, 27 January 1885, through missing stays in a squall.

STAG (258), barque, of Melbourne, became missing in 1903.

STAR, schooner, was wrecked on Murray Reef, Warnbro Sound, 20 October 1880. Inquiry was held at Fremantle. The master had neglected to use the lead.

STAR OF AUSTRALIA, s.s., left Sydney for Rockhampton, 24 January 1865, and was never again heard of. 17 were aboard.

STAR OF GREECE, ship, was wrecked on a reef off Willunga, 13 July 1888, 17 lives being lost. The survivors drifted ashore on wreckage.

STAR OF PEACE (1855), Aberdeen White Star wooden clipper ship, sold to Burns Philp, Sydney, was converted into a coal hulk at Thursday Island and broken up in 1895.

STAR OF THE SEA, schooner, was wrecked at the entrance to Brunswick River, near Byron Bay, in 1878.

STAR OF THE WEST, schooner, was wrecked during a hurricane at Broome, 17 April 1904.

STAR QUEEN, barque, stranded on Sister's Reef, Western Australia, 29 July 1878, through the master's negligence. She was lost on Oshima, Goto Isles, 22 January 1879.

STARTLED FAWN, was burnt in 1855.

STATES, was lost in Torres Strait, 22 April 1829.

STIRLING CASTLE (500), brig, was lost, 22 May 1836, on Eliza Reef (now called Swain Reefs), east of Bowen. See article STIRLING CASTLE, THE.

STORM BIRD, schooner, of Sydney, missing, is supposed to have foundered with loss of all (7) hands, in SE. gale, 6 May 1870.

STORM KING, of Sydney, foundered 15 miles off Seal Rocks, 30 March 1877. She suddenly sprang a leak.

STORM KING, schooner, was wrecked on Oyster Bank, Newcastle, 6 November 1856.

STRATHMORE (90), ketch, was wrecked on the eastern coast of Tasmania, June 1895.

SUCCESS, H.M.S., stranded in 1829 in Challenger Passage, and was beached in Careening Bay, Cockburn Sound, but with so much damage that she was not repaired until next year.

SUCCESS, barque, was lost on the coast, 9 July 1878.

SUCCESS (49), barge, was wrecked on Troubridge Shoal, May 1917.

SUFFOLK (380), brig, was lost on Tuggerah Beach, 4 September 1859.

SUFFOLK (231), barque, of Melbourne, was abandoned and burnt at Cape Howe, May 1879.

SULINA, schooner, was lost in a hurricane off Broome, 24 January 1879.

SULTANA, was wrecked on Troubridge Shoal, 27 September 1849, near the dry isle. She was bilged and full of water. The wreck was sold.

SUMATRA (584), s.s., owned by New Guinea administration, bound from Sydney to Rabaul, foundered in SE. gale off Port Macquarie, 26 June 1923. All (46) were lost.

SUMMER CLOUD (335), barque, stranded in Wreck Bay, 5 December 1870.

SUMMER ROSE (83), schooner, of Sydney, foundered on the coast of New South Wales, February 1890.

SUN, Sydney to Singapore, was lost in Torres Strait in 1826.

SURPRISE (115), schooner, foundered off Terrigal, January 1891.

SUSANNAH BOOTH (111), brigantine, of Sydney, was wrecked on Richmond River Bar, April 1876.

SUSANNAH CUTHBERT (161), s.s., of Sydney, was wrecked in foggy weather on Long Reef, near Manly, 7 July 1875.

SUSANNE GODEFFROY (1137), ship, of Sydney, was wrecked at Nobby's, Newcastle, September 1880, several lives being lost. She was in unseaworthy condition.

SUSIE (44), schooner, was wrecked at Port Stephens, January 1891.

SUSSEX (446), barque, of Geelong, in August 1870, on voyage from Newcastle to Melbourne, was wrecked on Point Nepean, owing to the uncertificated master not attending to the navigation while nearing the heads.

SUSSEX (966), ship, from London to Melbourne, was wrecked on Barwon Heads, 31 December 1871, through default of the master in not certifying the ship's position before attempting to make Port Phillip Entrance. 6 lives were lost in a boat.

SUSSEX (97), schooner, left Trial Bay, 29 January 1890, ran into SE. gale, and was not again seen. There were no survivors.

SWALLOW, coaster, was wrecked at Macleay River, June 1839.

SWAN (148), brig, of Sydney, became missing in 1876.

SWIFT, schooner, was found bottom up on the beach north of Brunswick River, Queensland, 6 May 1849, with 2 men inside, who were cut out by the crew of barque *Louisa*, which was wrecked soon after.

SWIFT (129), schooner, of Launceston, was wrecked at Belfast, June 1855.

SWIFTSURE, was wrecked at Cape Sidmouth, July 1829, having left Sydney, 14 June 1829, for the Mauritius. All were safely landed.

SWORD FISH (155), brigantine, of Hobart, was wrecked at Waterhouse Island, Bass Strait, May 1882.

SYBIL (12), pearl lugger, was wrecked at Broome during a hurricane in 1917.

SYDNEY PACKET, was wrecked at Whale Island, 17 July 1837.

SYLPHIDE (296), barque, of Melbourne, was sunk in collision, at Long Reef, near Manly, by s.s. *Ballina*, 27 June 1877.

SYLVANI, ketch, was wrecked at Brisbane, 4 June 1892.

TALAVERA, ship, was badly damaged by fire at Sussex-street Wharf, Sydney, 14 January 1891.

TALLONG (6), ketch, was wrecked at Morna Point, 11 August 1913.

TAMAR (130), paddle steamer, of Sydney, sprang a leak and was beached off Terrigal, New South Wales, 11 January 1873. She became a total wreck, but all hands were saved.

TAMBAROORA (262), s.s., of Sydney, was wrecked on Masthead Reef, Capricorn group, 22 July 1879. Previously she had stranded on voyage from Sydney to Brisbane, 23 March 1877, through negligence of the master and first and second mates, whose certificates were cancelled.

TAMERLANE (768), iron barque, was built in 1861 for Thomson, Dickie and Co., of Glasgow, and traded to Australia, afterwards being converted into a coal hulk at Fremantle. On 10 September 1926, she was towed out to sea and sunk with explosives.

TAM O' SHANTER, barque, South Australia to Sydney, was lost on the coast of Tasmania, August 1837.

TAPAHAN, brigantine, was taken aback and driven ashore on Seal Rock Point, 20 November 1879. She was being navigated too close inshore.

TARAMUNG (814), s.s., of Melbourne, foundered on the coast of New South Wales, May 1891. All lives (23) were lost.

TARTAR, a small vessel owned by C. Friend of Hobart, was wrecked on King Island in 1835, a short time before the *Neva* (q.v.). No lives were lost. Soon afterwards the crew found and assisted the survivors of the *Neva*, and all were rescued from the island a month later by C. Friend, who happened to be passing and saw their signals.

TASMAN (560), ship, of Hobart, ran ashore at Port Phillip Heads in 1851, but was refloated.

TASMAN (490), s.s., of Hobart, was wrecked on Hippolyte Rocks, Tasmania, 30 November 1883. The chief mate's certificate was suspended for twelve months.

TASMANIA, barque, from Sydney, was wrecked in 1853.

TAUFAHAU (135), brigantine, of Sydney, was wrecked on Seal Rocks, November 1879.

TAVIUNI, s.s., sank in collision with *Nera* in Darling Harbour, Sydney, 2 October 1911. Refloated, she was broken up in Sydney, June 1924.

TEA TEPHI (23), schooner, foundered at Twofold Bay, August 1894.

TEIRPAN (222), barque, foundered between Newcastle and Brisbane, 6 June 1876, all hands being saved in boats.

TEKAPO (1544), s.s., was wrecked at Maroubra Bay, near Sydney, May 1899. She ran ashore in fine, but misty, weather, with no lives lost.

TELEGRAPH (507), s.s., A.S.N. Co., was lost near Camden Head, 9 October 1867. Ship and cargo were lost, but all hands saved.

TELEPHONE (69), cutter, was wrecked at Ross Creek in 1891.

TELL (302), barque, of Sydney, was wrecked in 1872.

TEMPLAR, ship, grounded on Swan Point, Port Phillip Entrance, 31 December 1853. She could not obtain a pilot, but came off again uninjured.

TENTERDEN (867), s.s., of Sydney, was wrecked in Macdonnell Bay, near Cape Northumberland, 19 December 1893.

THALES, s.s., struck an uncharted rock off Mt. Adolphus Island, near Torres Strait, 24 March 1877.

THAMES, was lost on Swan River in 1830.

THE DART. See *Arrow*.

THELMA (23), yacht-yawl, was wrecked on Dobroyd Reef, Sydney Harbour, during SE. gale in the afternoon of 8 March 1913. One life was lost; 9 sur-

vivors were rescued with difficulty by pilot s.s. *Barundah*.

THE QUEEN (71), schooner, foundered off Port Macquarie, February 1892.

THERESA (18), ketch, was wrecked at Baranju, Broken Bay, 9 October 1913.

THETIS (127), schooner, was lost on a reef off Point Nepean, with 4 lives, on a dark, dirty night, when arriving from Sydney, 20 May 1848. 20 were saved.

THETIS, old French cruiser, many years a hulk at Noumea, was towed to Sydney and dismantled in 1905, and then towed to Folly Point (Wreck Bay) in Middle Harbour, where she was burnt, January 1907.

THE TWO FRIENDS (15), fishing boat, left Geraldton, 6 August 1925, and is supposed to have been lost off Dirk Hartog Island with 3 men.

THISTLE (275), paddle steamer, on voyage from Melbourne to Port Albert had insufficient coal aboard and had to burn her deck cargo, but was lost on Port Albert Bar, 24 December 1859.

THISTLE (1147), barque, of Fremantle, became missing, May 1903.

THISTLEBANK, ship, was badly damaged by fire at Hoffnung's Wharf, Dawes Point, Sydney, 31 January 1896.

THODE FRAGELUND, s.s., of Norway, stranded on Cronulla Reef, 22 January 1908, but was refloated. The damage amounted to £20,000.

THOMAS A. COLE, ship, struck on a rock off Port Phillip Entrance in 1856.

THOMASINE, was wrecked near Torres Strait in 1854.

THOMAS LORD, pearl schooner, from Sydney, had her boat's crew and supercargo killed by natives of Mulgrave Island, Torres Strait, in 1846.

THOMPSON, cutter, was found by Commander Lipson wrecked near Cape Jaffa. It is supposed that she was swamped by heavy rollers and that all her crew perished about 1865.

THORDIS (about 6000), Norwegian s.s., loaded coal at Newcastle and proceeded to complete loading at Port Stephens, where she was wrecked while entering, 4 March 1906. No lives were lost. She soon broke up.

THORNLIEBANK, barque, was burnt at Fremantle, February 1891.

TIEN-TSIN (254), barque, of Launceston, was wrecked at Cape St. Helens, east coast of Tasmania, December 1875.

TIGER, schooner, of Sydney, was wrecked at Bulli during the heavy easterly gale of 13 July 1866. 3 lives were lost and 3 saved.

TIGRESS (109), schooner, of Sydney, was wrecked in 1872.

TILBA (97), s.s., from Narooma to Sydney, was wrecked at Wreck Bay, 18 November 1912, in thick weather. The master had set an incorrect course.

TIME (1670), s.s., was wrecked near Beachport and Cape Martin, 13 January 1911.

TINONEE, s.s. See *Eurus*.

TITANIA (879), famous tea clipper ship, Italian owned, was seriously damaged by collision with s.s. *Konoowarra* on voyage from Adelaide to Sydney in 1894. Towed to Sydney and repaired, she was eventually broken up at Marseilles.

TOBAGO, brig, was wrecked in Tamar River near Launceston, June 1845.

TOCOPILLA (440), hulk, of Fremantle, was towed to sea and sunk, February 1924.

TOMKI (376), s.s., of Sydney, was wrecked at Richmond River, 16 September 1907, with no loss of life.

TOM TOUGH, stranded in the Gulf of Carpentaria and was condemned, August 1856.

TOROA (174), s.s., was wrecked in Bass Strait, April 1916.

TORY, ship, from England, was wrecked at Port Stephens in 1853.

TOTTIE (74), schooner, of Sydney, was wrecked on Camden Haven Bar, November 1896.

TOTTIE, hopper, foundered off Sydney Heads, 2 February 1905.

TRADER (45), schooner, was wrecked in Port Phillip, November 1888.

TRAMP (92), schooner, was dismasted and leaking off Smoky Cape, 5 July 1913. All hands were rescued by boat from s.s. *Lord Cromer* while a big sea was running. She was brought safely into port a few days later, but was totally wrecked at North Head, Sydney, 31 January 1915.

TRAVELLER (117), schooner, of Sydney, was wrecked at Nelson Bay, Port Stephens, 1 May 1874, her cables having parted.

TRAVELLER, ketch, was wrecked in Brisbane Water, Broken Bay, 20 November 1868, with 3 lives lost.

TRIABUNNA (14), barge, of Hobart, was wrecked on Mills Reef, February 1916.

TRIAL, cutter, was lost at Macleay River, May 1839.

TRIDENT, s.s., was wrecked at Moruya, 6 September 1894, with no lives lost.

TRILBY (75), s.s., was wrecked on Port Macquarie Bar, 16 October 1907.

TRINCULO (318), barque, of Melbourne, was wrecked at Ninety Mile Beach, May 1879.

TRIO (119), paddle steamer, of Sydney, was wrecked at Port Stephens, drifting ashore in NE. gale, 28 February 1870.

TRIO (90), ketch, foundered on the coast of New South Wales, September 1894.

TRITON (119), schooner, of Newcastle, was wrecked about 1870.

TRIUMPH (83), ketch, was wrecked at Tacking Point, 12 January 1903.

TRUGANINI, was wrecked near Port Phillip, December 1841, with crew saved.

TRUSTY, schooner, stranded at Point Nepean, 20 March 1883. The master was exonerated.

TUGGERAH (62), cutter, was wrecked at Byron Bay, March 1894.

TUGGERAH, s.s., foundered near Port Hacking, 17 May 1919, during southerly gale, 6 lives being lost.

TUNCURRY (71), s.s., foundered off Broken Bay, October 1916, with no lives lost.

TUSPAN (222), barque, of Sydney, was abandoned and foundered, June 1876.

TWEED (151), s.s., was wrecked on Tweed River Bar, 19 April 1888. The loss was attributed to the intricacy and narrowness of the channel.

TWEED (185), s.s., was wrecked at Byron Bay, January 1893.

TWINKLING STAR, stranded on Garden Island, near Fremantle, 30 January 1872.

TWINS (144), schooner, of Sydney, was wrecked some years prior to 1876.

TWINS, ketch, stranded on Lonsdale Reef, 8 April 1883. The master's certificate was suspended for three months.

TWO FRIENDS, brig, was lost near Inner South Head, Sydney, November 1851.

TYBEE (271), barque, was lost while entering Port Stephens, New South Wales, 30 August 1864. 7 lives were lost, 3 saved.

TYBURNIA (948), frigate-built ship, was sold to an Australian firm and converted into a coal hulk at Townsville prior to 1900.

TYRA (278), lighter, of Brisbane, was burnt in Brisbane River in 1879.

UNA (766), ship, of Melbourne, was converted into a hulk in 1876.

UNCLE TOM (26), ketch, of Sydney, was wrecked at Lake Macquarie, December 1875.

UNDAUNTED (55), schooner, of Sydney, was wrecked in 1873.

UNDINE, schooner, was lost at the entrance to Nambucca River, February 1878.

UNDOLA (185), s.s., foundered, 20 September 1918, a few miles north of Wollongong, and is believed to have struck a floating mine from the German raider *Wolf's* minefield off Gabo. All lives were lost.

UNION (251), brigantine, of Newcastle, foundered in 1868.

UNION (361), barque, of Newcastle (foundered), became missing, July 1876, with all hands.

UNION (57), s.s., was wrecked on Richmond River Bar, 29 April 1892.

UNITY (35), s.s., was wrecked at Stockton Beach, near Newcastle, 2 May 1907. No lives were lost.

UPOLU, schooner, was wrecked on an uncharted sunken rock in Trinity Opening through Great Barrier Reef (off Cairns), 24 April 1886, through careless navigation.

URANIA (101), schooner, left Newcastle, 3 December 1876, and was not again heard of. Six lives were lost.

URARA (241), s.s., was wrecked in fine weather on Clarence River Bar, 4 May 1866.

VARNA, was wrecked, January 1858, on Point Hibbs.

VAROON, was wrecked near Cape Northumberland, South Australia, in 1856.

VELOCIDADE (268), brigantine, of Lyttelton, became missing with all hands in 1874.

VENTURE (167), brigantine, of Sydney, was wrecked at Cygnet Bay, November 1890.

VENUS (83), schooner, was wrecked near the bar of Bellinger River, 9 June 1891, during a heavy gale. The crew were gallantly rescued by volunteers in spare pilot boat.

VERNON (1200), Green's Blackwall Line, frigate-built ship, launched in 1839, with paddle wheels, which were removed before proceeding to sea. She was an East Indiaman, until she was placed on Australian trade from 1863 to 1870, when she was sold to the British government for a reformatory ship. As such, she lay in Port Jackson, until destroyed by fire as she was being dismantled alongside *Golden South* in Kerosene Bay, 29 May 1893.

VESTA (68), paddle steamer, of Sydney, was wrecked in 1873.

VICEROY (150), schooner, of Melbourne, sank in collision with s.s. *Wonga Wonga*, 6 April 1864.

VICTOR (227), brig, was wrecked at the entrance to Newcastle Harbour, 19 March 1866.

VICTORIA, schooner, of Auckland, became missing on voyage between Sydney and Macleay River, having left on 25 October 1867. 7 lives were lost.

VICTORIA TOWER (1563), ship, on voyage from Liverpool to Melbourne, was lost in October 1869, off Bream Creek, near Port Phillip Heads, through standing in too far before hauling to SE. in thick weather. No lives were lost.

VICTORY (142), brigantine, was wrecked at Richmond River in 1875.

VICTORY (142), brigantine, was wrecked at Cape Howe, November 1893.

VILLAGE BELLE (129), brigantine, of Sydney, was wrecked in 1873.

VINCENNES (1740), French barque, ran ashore in an easterly gale on Ocean Beach, Manly, at 10 p.m. on 24 May 1906. No lives were lost. She attracted thousands of visitors to Manly until towed off, 2 June 1906, almost undamaged.

VINE, schooner, of Sydney, was lost on Seal Rock Point, 3 September 1877.

VIOLET DOEPEL (114), schooner, of Sydney, foundered near Bellinger Heads, 24 January 1905.

VIRAWA, s.s., stranded on Dugdale Rocks, Thursday Island, 12 September 1891.

VISION (57), s.s., was wrecked at Bermagui, 13 January 1911.

VIXEN, schooner, was lost near Nobby's, Newcastle, 3 September 1858.

VLISSINGHN (150), s.s., of Rockhampton, sank in collision in the Fitzroy River, June 1898.

VULCAN, coastal cutter, was wrecked at Newcastle, December 1837.

VOLGA, ship, was wrecked in Prince of Wales Channel near Thursday Island, 6 August 1890.

VORTIGERN (896), ship, of Adelaide, was wrecked in 1867.

WAGGA WAGGA, s.s., foundered in Murrumbidgee River while towing a barge, 10 August 1913.

WAIMEA (240), s.s., of Sydney, was wrecked at Richmond River, 16 January 1872.

WAINONI, yacht, 20-footer, sank 2 miles outside Sydney Heads, 19 December 1925. 4 hands were saved.

WAIPARA, s.s., stranded on Smith Rock, Cape Moreton, but was refloated, August 1909.

WAI WEER (29), schooner, capsized in Torres Strait, June 1916.

WALLACE, ship, was wrecked in D'Entrecasteaux Channel, while proceeding to Hobart, 7 September 1835. No lives were lost.

WALLACE AND BRUCE (103), brigantine, of Sydney, was wrecked near Richmond River, October 1878.

WALLAMBA (331), s.s., was wrecked at Morna Point, near Port Stephens, 11 July 1923. The crew were saved. A southerly gale was blowing.

WALLARAH (633), s.s., was wrecked at Catherine Hill Bay, April 1914.

WALLAROO (488), barque, of Adelaide, stranded in Wallaroo Bay, May 1873.

WALLA WALLA, s.s., sank, 4 January 1902. 27 were drowned.

WALTER HOOD (936), Aberdeen White Star clipper ship, was wrecked at Wreck Bay, Ulladulla, 27 April 1870, while bound from London for Sydney. The captain and 12 men were drowned; a number of survivors were kept by heavy sea for several days on the wreck before being rescued.

WANDERER, from Launceston to Sydney, was wrecked on Middle Head, Port Jackson, 9 July 1848, the crew being saved.

WANDERER, schooner yacht, was owned by Ben Boyd, who in 1851 was killed by natives in Wanderer Bay, Guadalcanar Island, Solomons. They attacked the yacht, but were beaten off. She then sailed for Sydney, but was wrecked while crossing Port Macquarie Bar. All hands were saved.

WANDERER, was wrecked on Barren Island, Bass Strait, 17 July 1861.

WANDRA (164), s.s., foundered off Drumsticks, Jervis Bay, 15 December 1915.

WANGANUI (179), s.s., of Dunedin, was wrecked at the entrance to Clarence River, 20 June 1880. She attempted to enter at wrong state of tide.

WARATAH (109), schooner, left Newcastle for Sydney, 2 June 1864, and was not heard of later. Seven lives were lost.

WARATAH (268), s.s., was wrecked at Bulli, June 1887.

WARATAH (202), barque, of Adelaide, was wrecked on Rocky Island, Gulf of Carpentaria, 3 February 1891.

WARATAH, Lund's Blue Anchor s.s. See Section III.

WARILTA, brigantine, was wrecked at Maryborough, 16 June 1892.

WAROOKA, s.s., sank at Port Adelaide, 6 May 1892.

WARREGO (1552), A.U.S.N. Co. s.s., while being overhauled in Brisbane River took a list at night when on the mud at low water; water flowed in where a plate was being renewed, filling her completely, 28 January 1906. She was refloated three days later.

WARRIGAL (78), ketch, of Melbourne, is supposed to have been wrecked about 1917.

WARUNG, tug, sank in Watson's Bay, Sydney, 12 June 1906, by collision with s.s. *Guthrie*. One life was lost.

WATERLOO, schooner, constant trader, was lost in Cloudy Bay in 1833.

WATER WITCH (140), schooner, of Sydney, was wrecked at King Island, October 1854, without loss of life.

WATER WITCH (115), brigantine, of Sydney, was wrecked in Torres Strait, August 1884.

WATER WITCH (236), barque, of Hobart, was wrecked in 1917.

WAUCHOPE (162), s.s., of Melbourne, was destroyed by fire at Portsea, Port Phillip, August 1919.

WAVE (105), schooner, of Sydney, was wrecked on Port Albert Bar, December 1859.

WAVE (195), brig, from Newcastle, was wrecked off Terrigal, 8 February 1868, during SE. gale. All hands (9) were lost.

WAVE, ketch, was wrecked off Sandy Strait, 6 June 1919.

WAVE QUEEN (250), barque, of Adelaide, was wrecked at Rivoli Bay, September 1874.

WAVERLEY (216), brig, of Sydney, was wrecked at River Don, 9 July 1880, through the master not obtaining a pilot.

WAVERLEY, ship, was wrecked in Thirsty Sound about 1900-1910.

WAVERTREE, ship, was badly damaged by fire at Hoffnung's Wharf, Dawes Point, Sydney, 7 June 1892.

WELLINGTON (110), s.s., was wrecked at Nambucca Heads, 5 December 1892. No lives were lost.

WENDOUREE (1066), s.s., of Melbourne, stranded near Wilson's Promontory, 17 February 1885, in foggy weather, but was refloated later. She was wrecked on Oyster Bank, Newcastle, 20 July 1898.

WENTWORTH (610), s.s., of Sydney, was wrecked near Bowen, June 1887.

WERFA, coal hulk, was sunk in Victoria Dock, Melbourne, 5 August 1925, by U.S.A. destroyer *Macdonough*, when the U.S.A. Squadron was leaving Melbourne.

WESTARIA, brigantine, was wrecked in Capricorn group, September 1887.

WESTERN STAR (124), brigantine, foundered after collision with s.s. *Tagliaferro* near Newcastle, 15 July 1904. Four lives were lost.

WESTHARTLEY No. 1 (69), schooner, of Sydney, was wrecked in 1874.

WESTHARTLEY No. 2 (69), schooner, of Sydney, was wrecked in 1873.

WEST WIND (500), paddle s.s., was burnt in Hobson's Bay, Melbourne, 27 February 1854.

WHAMPOA, s.s., was badly damaged by fire at Colonial Sugar Refinery Co. Wharf, Sydney, 31 March 1886.

WHAUP (39), ketch, of Sydney, was abandoned at Double Island Point, January 1910.

WHISTLER, American ship, was wrecked on the eastern side of King Island, 1855, without loss of life.

WHITE HAWK, s.s., was launched and burnt at Hobart in 1850.

W. H. LINCOLN, was totally destroyed by fire at Cowper's Wharf, Woolloomooloo, Sydney, 4 January 1892.

WILD WAVE, ketch, was wrecked at Cronulla in 1853.

WILD WAVE (223), barque, of Adelaide, was wrecked at Stanley, June 1923.

WILLIAM, brig, was wrecked near Torres Strait in 1830, 21 days after leaving Sydney.

WILLIAM (121), brig, of Sydney, stranded in 1873, and was wrecked.

WILLIAM AND ALEXANDER (58), ketch, was wrecked at Terrigal, August 1892.

WILLIAM AND BETSY, of Sydney, stranded in 1876.

WILLIAM BUCHANAN, barque, of Melbourne, struck a rock and foundered near Clarence River, 8 December 1864.

WILLIAM FAIRBURN (1250), hulk, of Brisbane, was broken up at Goode Island in 1903 after many years as a coal hulk.

WILLIAMS, s.s., stranded on Lonsdale Reef, Port Phillip, 4 July 1883. No blame was attached.

WILLIAMS (56), s.s., was wrecked on Stockton Beach, near Newcastle, in November 1922. No lives were lost.

WILLIAM WATSON (384), barque, was wrecked on

Stockton Beach, 13 July 1866, while trying to enter Newcastle Harbour in heavy easterly gale. Two lives were lost, eight saved.

WILLIAM WOOLLEY, ship, was burnt at Sydney, May 1834.

WILLINGA (71), schooner, of Sydney, was wrecked near Port Stephens, 27 May 1908.

WILL O' THE WISP (150), schooner, from Auckland, was wrecked at Port Phillip Entrance, October 1853. No lives were lost.

WILLUNGA (363), dredge, foundered between High Peak and North Reef, Queensland, 28 December 1915.

WILLYAMA (1713), s.s., of Adelaide, was wrecked at Marion Bay, April 1907.

WILPENA (12), ketch, foundered off Point Jarrold, November 1911.

WINCHESTER (336), barque, was burnt at Port Phillip Heads, 16 April 1853, while at anchor outward bound from Melbourne, through using naked light in the hold. No lives were lost.

WINDHOVER (847), clipper ship, built in 1868, China tea clipper and later on Australian trade, was wrecked on the Australian coast shortly after 1887.

WINDHOVER, brig. See Section III.

WINGS OF THE WIND. See *Flying Arrow*.

WINSOR, s.s., was wrecked in Pelsart group, 2 February 1908.

WISTARIA (373), barque, of Adelaide, was wrecked on One Tree Island, Capricorn group, September 1887, through incompetence of master and mate. The master's certificate was cancelled.

WOLLOMAI, schooner, stranded on reef near Flinders Island, Bass Strait, 11 February 1883.

WOLLOMAI (143), schooner, of Adelaide, was wrecked at Apollo Bay, June 1923.

WOLLONGBAR (811), s.s., parted her moorings during a heavy easterly gale alongside the wharf, Byron Bay, 14 May 1921, was driven ashore, and became a total wreck.

WOLLUMBIN (147), s.s., was wrecked near Bellinger River, November 1905. She sprang a leak and was beached to prevent foundering, but became a total loss.

WONGA WONGA (682), s.s., of Sydney, was broken up at Sydney, January 1881.

WONGA WONGA, schooner, was lost at Terrigal, 15 March 1882. She missed stays and drifted into breakers.

WONGA WONGA, ketch, Nambucca to Sydney, foundered in 1884, four lives being lost.

WONGRA BELL (22), launch, was wrecked at Snowy River, April 1912.

WONIORA (123), s.s., foundered off Botany Bay, 1882. 15 lives were lost, one saved.

WOODLARK (237), brig, was lost near Seal Rocks, New South Wales, 16 February 1868, during heavy SE. gale.

WOODPECKER, schooner, was wrecked near Port Macquarie, 13 July 1866, during heavy easterly gale, with one life lost.

WOODPECKER (37), schooner, of Sydney, became missing in 1875, and is supposed to have foundered.

WOOLLOOMOOLOO, ketch, was lost in Trial Bay, 2 June 1864, with three lives.

WOONONA (404), s.s., was wrecked at Fitzroy River, 17 October 1893.

WOTONGA (541), s.s., of Sydney, was wrecked at Tacking Point, 2 January 1882. The wrong course was steered.

WRESSEL CASTLE (316), barque, of Melbourne, became missing in October 1877.

W. WOLFF, ship, was wrecked on Hummock Island, Bass Strait, 8 August 1912.

WYOMING (175), s.s., was wrecked on Kailoa (or Kiola) Beach, N.S.W., 28 October 1910, during a moderate gale with heavy rain.

WYRALLAH, Huddart Parker s.s., sank in collision with s.s. *Dilkera* in the Rip, Port Phillip, 7 April 1924, with 3 lives lost. *Wyrallah* was held to be to blame.

XANTHO, s.s., of Fremantle, was wrecked at Port Gregory, 17 November 1872. The master was exonerated, having used all means to save the ship.

XYLON (600), ship, of Melbourne, was converted into a hulk about 1897.

YAMBACOONA (83), s.s., was wrecked at Broken Head, near Broken Bay, 24 February 1917. All were saved.

YARRA (121), schooner, of Sydney, was wrecked at the entrance to Newcastle Harbour, February 1874.

YARRA (37), sloop, of Melbourne, became missing with all hands in 1877.

YARRA YARRA (351), paddle steamer, of Sydney, owned by Captain W. Summerbell, his nephew being master, left Newcastle in SE. gale and in attempting to return was wrecked, all hands being drowned, 15 July 1877. In order to give relief to dependants of the crew, the National Shipwreck Relief Society of New South Wales was established in July 1877.

YARROW (229), brig, was wrecked, August 1870, on Lonsdale Reef (on voyage from Newcastle to Melbourne), through the master attempting to enter Port Phillip Heads before getting leading lights on a proper bearing.

YONGALA (1825), s.s., with passengers, foundered between Mackay and Townsville during a hurricane, 24 March 1911. All lives, 140, were lost. No trace of her was found.

YOUNG AUSTRALIA (1020), wooden clipper ship, built 1853, Black Ball Line, was wrecked off Cape Moreton, 31 May 1872. The wind failing as she was going about, she was set on to the rocks by tide and current. No lives were lost.

YOUNG AUSTRALIAN (131), schooner, trader from Brisbane to Adelaide, was lost off Curdie's Inlet, 28 May 1877, through defective state of rigging.

YOUNG AUSTRALIAN (58), schooner, of Adelaide, was wrecked in 1873.

YOUNG BUNGAREE and ENERGY, tugs, came into collision off Red Head, near Newcastle, 3 January 1885.

YOUNG DICK (162), schooner, is supposed to have been wrecked on the Queensland coast, July 1886. About 150 kanakas were lost, as well as all the crew. See Section III.

YOUNG LACHLAN, was piratically seized by convicts at Hobart and never again heard of.

YOUNG LION, ketch, was lost off Cape Elizabeth, 18 October 1882. The mate was blamed.

YOUNG TOM, ketch, left Newcastle, 25 July 1885, for Townsville and was never heard of again.

YOU YANGS (477), s.s., of Sydney, was wrecked off South Australia, 14 June 1890.

ZEPHYR, brigantine, was wrecked on Craggy Island, Bass Strait, 14 July 1882, through error of judgment on the part of the master.

ZEPHYR (1312), ship, of Adelaide, was broken up in 1903.

ZEPHYR (91), brigantine, was wrecked at Maria Island, Tasmania, August 1913.

ZODIAC (316), barque, was wrecked near Camden Haven, July 1890.

ZONE (95), schooner, of Sydney, was wrecked while entering Newcastle Harbour, 19 March 1874. The lifeboat upset and the mate and 3 of her crew were drowned.

SECTION III

LOSSES BETWEEN JANUARY 1826 AND SEPTEMBER 1926 TO VESSELS ON VOYAGES TO OR FROM AUSTRALIA, AND TO AUSTRALIAN-OWNED VESSELS, CHIEFLY IN NEW ZEALAND, NEW GUINEA, AND SOUTH SEA ISLANDS. A FEW NEW ZEALAND VESSELS ARE INCLUDED ON ACCOUNT OF THEIR SPECIAL INTEREST.

ABERCROMBIE, schooner, Captain Petley, was lost on the Mauritius, 1845.

ACACIA (218), barque, was wrecked at South Head, Hokianga, New Zealand, 29 July 1863.

ACTIVE, Captain Dixon, sailing among Fiji and Tonga groups, was wrecked about 1836.

ACTIVE (152), brigantine, of Auckland, was wrecked at Samoa, December 1880.

ADA C. OWEN (183), brigantine, of Auckland, was wrecked at Tahiti, February 1889.

ADDENDA, American 4-masted brigantine, was wrecked near Cape Palliser, New Zealand, on voyage from Lyttelton to Newcastle, October 1904. All hands landed safely after a strenuous struggle through heavy surf.

ADELAIDE, ship, from Adelaide, put into the Mauritius on fire, February 1853.

ADIMAU (13), schooner, of Suva, was wrecked in 1911.

A. E. KILLAM, barque, from Newcastle, was beached and destroyed by fire at Iquique, 15 February 1888, through spontaneous combustion of coal cargo.

AELUS (17), cutter, of Auckland, was wrecked at Samoa, October 1888.

AEON (2759), s.s., was wrecked at night on Christmas Islands, mid-Pacific, while bound from San Francisco to Sydney, 18 July 1908. All hands were saved, a boat having sailed to Fanning Island to bring relief.

AGENOR (1488), ship, for many years an Australian trader, was wrecked in Japan, August 1906.

AGINCOURT (4232), s.s., from Port Kembla for Hong Kong, was wrecked on Cossal Reef, Pelew group, 2 March 1906. A board of trade believed that the master had erased the reef from his chart.

AGNES BELL (149), schooner, of Auckland, was wrecked at Rarotonga, December 1883.

AGNES JESSIE (187), brigantine, of Hobart, was wrecked at Portland Island, New Zealand, June 1882.

AGNES NAPIER, schooner, was wrecked on Middleton Reef, Tasman Sea, about 1859.

AIGBURTH (1838), ship, Newcastle to Java, was wrecked, 16 June 1904, on a reef off Rooke Island

between New Guinea and New Britain, 16 were saved in boats. One boat with 7 hands was missing until October, when they were found by the German government.

AIREDALE (286), s.s., of Sydney, was wrecked at Taranaki, New Zealand, February 1871.

ALBATROSS, schooner yacht, of Royal Yacht Squadron, bound for South Sea islands via Australia, was wrecked on a reef in Ringgold Isles, Fiji, 27 October 1870. No lives were lost.

ALBERT (44), schooner, of Brisbane, was wrecked in Louisiade group, New Guinea, June 1888.

ALCMÈNE, French frigate, was wrecked on the beach 15 miles south of Hokianga, New Zealand, in 1851. Previously, when at New Caledonia, 12 of her crew had been killed and devoured by natives of Nenema Island.

ALEIDA (1066), Norwegian barque, from Dunedin to Surprise Island, New Caledonia, was wrecked at the latter place while about to load guano for Hobart, 28 October 1908.

ALEXA (410), barque, of Invercargill, was wrecked at Surprise Island, north of New Caledonia, July 1901.

ALEXANDER NEWTON (309), barque, was wrecked at Portland Island, New Zealand, 30 June 1894.

ALEXANDRA, or ALEXANDRA OUBIS. See *Cairnbulg*.

ALFRED VITTERY (122), Queensland labour schooner, was wrecked in Solomon Islands, March 1884. No lives were lost.

ALICE BROWN, was lost in the South Sea islands, October 1859.

ALICE CAMERON, barque, in Sydney-Auckland trade, left Newcastle for Manila about 1871 with coal and was never heard of again.

ALICE DAVIES (590), barque, Liverpool to Adelaide, general cargo, collided in the Mersey with s.s. *Cherbourg*, 21 November 1878, 5 lives being lost.

A. L. JOHNSTONE, barque, was wrecked in Torres Strait in 1854.

ALLIANCE (900), barque, from Newcastle to Peru, stranded near Callao, October 1905.

ALL SERENE, ship, from Puget Sound to Sydney, capsized, January 1864, in 24° S., 176° W., about 50 miles from Friendly Islands. Several lives were lost. 31 survivors built a punt during a few days before she finally sank, and eventually 17 reached Fiji.

ALMA (163), brigantine, of Dunedin, was wrecked on Elizabeth Reef, near Auckland, August 1883.

ALMA (600), Norwegian barque, while loading for Launceston at Malden Island, was blown ashore and wrecked, 1 February 1906. No lives were lost.

ALMEDIA (1477), Norwegian ship, from Melbourne to Nehoue, New Caledonia, was wrecked there, May 1905. No lives were lost, though the crew were 3 days in boats. She missed stays when close on to a reef.

ALPHA (36), ketch, foundered near Waiwera, New Zealand, January 1892.

ALSAGER, ship, of Melbourne, was abandoned in the South Pacific, March 1873.

ALSTERNIXE (3000), formerly *Lord Templemore*, ship, became missing in 1907 on a voyage from Callao to Sydney.

AMELIA, from Sydney to Manila, was wrecked in St. Bernardino Strait, Philippines, 30 April 1843. 6 were drowned.

AMERICANA (901), four-masted schooner, of Honolulu, became missing with all hands, 9 August 1913.

AMPHITRITE (208), ship, from London, was lost on the French coast off Boulogne, 30 August 1833. A hundred female convicts were aboard, and 134 lives were lost, only 3 being saved. She was driven ashore in a NW. gale and broke to pieces in the heavy surf on the beach.

AMY TURNER (990), Australian brigantine, from Newcastle to Manila, foundered in heavy weather off Guam Island, 27 March 1923. 11 lives were lost, 4 being saved in a boat.

ANJOU, French barque, left Melbourne for Falmouth with wheat and was wrecked at Auckland Island, south of New Zealand, 5 February 1905. All hands were landed and were rescued 3 months later.

ANNABELL (348), brig, of Sydney, was wrecked at Kaipara, New Zealand, January 1885.

ANNASONA (1436), barque, formerly *Margaret A. B. Carswell*, was wrecked on Middleton Reef, January 1907, during voyage from Callao to Newcastle; all the crew (22) were landed at Lord Howe Island, 25 January.

ANNE MILLICENT, barque, stranded in Arafura Sea, 12½° S., 123¼° E., on an uncharted reef, 5 January 1888.

ANN GAMBLES, barque, was lost near Bluff Harbour, New Zealand, 16 May 1878, through attempting to enter at night.

ANNIE BROOKS, schooner, Queensland to Papua. While pearl fishing off Mewstone Island, SE. New Guinea on 5 November 1880, 6 white members of the crew were killed by natives, who looted and wrecked the vessel.

ANNIE WILSON (150), schooner, of Auckland, was wrecked at Taranaki, New Zealand, April 1893.

AOLA (44), schooner, of Sydney, was wrecked at Rubiana, Solomon Islands, July 1911.

APHRASIA (130), s.s., was built in 1840 and employed in Port Phillip until 1866, when she was sent to New Zealand and was wrecked in the New River.

ARABY MAID (837), ship, London to Port Chalmers, New Zealand, general cargo and passengers, stranded near Kingsdown, about 1894. One life was lost. The anchor failed to bring her up when in difficulty.

ARGUS, s.s., Currie Line, for a number of years trading from Sydney to Calcutta, was sold to Japanese, and a few months later, August 1905, struck a floating mine in the China Sea and sank.

ARIEL (1058), ship, built 1865, famous China tea clipper, sailed from London for Melbourne in 1872 and was never heard of again. Possibly she was broached to and lost between the Cape and Australia.

ARIEL (134), brigantine, was wrecked at Bougainville Island, Solomons, April 1894. All the crew landed safely, but 2 were poisoned by natives.

ARMEU, French barque, was wrecked off New Caledonia, 9 November 1909.

ASHMOUNT, s.s., from Australia to England, was wrecked near Port Elizabeth, South Africa, 26 April 1905. Several lives were lost in one boat; others landed safely. She was negligently navigated, and the certificates of the master and first mate were suspended for 6 and 3 months respectively.

ASKOY, ship, was wrecked on Elizabeth Reef, Tasman Sea, 27 December 1911.

ASTRACANA, ship, with 2500 tons of wheat from Geelong for Algoa Bay, put into Auckland in distress, having been very considerably damaged in bad weather, 2 August 1904.

ASTRONOMER (1119), ship, from South Australia to Dublin with wheat, stranded in Freshwater Bay, Pembroke, 21 March 1886.

ATLANTIC (60), schooner, was wrecked on Rarotonga Island, January 1888.

ATLANTIC (72), Queensland labour schooner, was wrecked in the Solomons, October 1890.

ATRAVEDA (457), barque, of Sydney, was wrecked at Hong Kong during a typhoon in 1871.

AUGUSTA, s.s., Lyttelton to Sydney, was wrecked on Cave Island, near Lyttelton, New Zealand, 10 February 1864. No lives were lost.

AUGUSTA (138), brigantine, of Rockhampton, was wrecked at New River, New Zealand, August 1884.

AURIFERA (436), barque, of Melbourne, was abandoned and foundered at sea between Newcastle and New Caledonia, 300 miles from Lord Howe Island, 24 July 1870.

AURORA (1700), Orient liner, iron clipper ship, built in 1874, was destroyed by fire in her cargo of wool, 9 August 1875, when off the Azores homeward bound on her first voyage.

AUSTRALASIAN PACKET (182), barque, of Sydney, was wrecked at Apia, Samoa, August 1878.

AUSTRALIA, ship, Leith to South Australia, was destroyed by fire, 3 February 1841, 600 miles from the Cape of Good Hope. Passengers and crew were saved.

AUSTRALIA, brig, was wrecked on the New Zealand coast, June 1873, on a voyage from Newcastle to Timaru.

AUSTRALIAN, ship, stranded on Green Point, near the Cape of Good Hope, 30 March 1854.

AUSTRALIAN (1953), ship, from Mazatlan, Mexico, to Sydney in ballast, left, December 1907, and was not heard of again.

AUSTRALIAN, ship, from Sydney to London, was wrecked on the coast of Brazil, near the river Continguba, 23 October 1868. No lives were lost, the passengers being taken off by tugboat.

AUSTRALIAN SOVEREIGN (353), wooden barque, of Newcastle, was wrecked on Simonee Reef, New Caledonia, 6 June 1880. She was built on Paterson River, New South Wales, at Wallalong, in 1872. The master's certificate was suspended for 3 months.

AUSTRALIND (429), barque, of Wellington, was wrecked at Taranaki, New Zealand, in 1882.

AVALANCHE (1160), Shaw Savill ship, outward bound to Wellington, with 60 passengers and 34 crew, came into collision off Portland with the ship *Forest*, bound to New York, 11 September 1877, and only 3 lives were saved. Both ships sank, 104 lives in all being lost.

AVANTI SAVOIA (1292), barque, of Newcastle, was wrecked on Shetland Islands, south of Cape Horn, April 1915.

AVON (19), cutter, of Auckland, was wrecked at Fiji in 1889.

AWANUI (96), s.s., of Auckland, was wrecked at Niue, Savage Island, north of Samoa, January 1919.

AWAROA (60), schooner, was wrecked at Poverty Bay, New Zealand, October 1892.

AYRSHIRE, barque, stranded on New Caledonia, January 1891.

AYRSHIRE, Federal Houlder s.s., was severely damaged by collision in the English Channel, and had to be beached, while on voyage from London to Australia early in 1910. She was repaired and refloated later.

BADGER (25), schooner, in 1833, was carried off by convicts, who probably landed on one of the South Sea islands.

BADGER, barque, Newcastle to Auckland. See *A. H. Badger*, Section II.

BANSHEE, barque, of Sydney, was lost in 1853 on the return from China, off Mindoro Island, Philippines.

BARBARA GORDON, barque, was wrecked at Cape Agulhas, 5 May 1853.

BARDIC (7960), White Star s.s., stranded and became almost a total loss off Fastnet, SW. of Ireland, 2 September 1924. She was on a voyage from Queensland to Liverpool. No lives were lost. She was refloated 2 months later, after remarkably fine salvage operations, and renamed *Horatius*.

BARON BLANTYRE (5193), s.s., left Durban, 10 August 1923, for Adelaide, with coal, and was not heard of again. All hands were lost.

BAUDA, barque, of London, was wrecked on Bampton Shoal, Coral Sea, 21 May 1877.

BELLA MARY (243), barque, stranded off Nagara, Viti Levu, Fiji, 2 March 1886, through having left Suva at an improper time.

BELLFLOWER (98), ketch, was wrecked on Banks Peninsula, New Zealand, July 1911.

BELLINGER, s.s., stranded near Waitara, New Zealand, 28 February 1888.

BELLS (341), brig, of Auckland, was wrecked in 1899.

BELTANA (734), Elder Company clipper ship, built in 1869, was burnt while loading wool at Port Lyttelton in 1874. In 1871 she had stranded on Kangaroo Island, then loaded wool at Port Augusta, but leaked so much that she had to be again discharged, and repaired at Adelaide.

BENGAL (428), barque, sprang a leak and foundered in Tasman Sea, 5 April 1872. The crew were rescued by another vessel.

BEN VENUE (1000), ship, for many years voyaging from London to Melbourne, was driven ashore and wrecked at Timaru, New Zealand, having arrived there with coal from Newcastle, May 1882. No lives were lost, but in attempting to get to her the lifeboat capsized and lost 6 of her crew. The *City of Perth* was also badly stranded near her but was refloated later.

BEN VENUE (2033), ship, on voyage from London to Sydney, was wrecked at Sandgate, Kent, while being towed down channel, November 1891. Several lives were lost.

BERENGARIA (1317), ship, of Glasgow, from Melbourne to Sunderland with wheat, foundered after striking Galloper Sand in the Nore, 1 December 1884, 12 lives being lost.

BESSIE (228), brigantine, of Fremantle, was burnt at Surabaya, April 1890.

BETHANY (359), barque, of Sydney, was wrecked at Cape May, New Jersey, U.S.A., March 1877.

BIARRITZ (1824), French ship, left Cherbourg, 10 October 1907, for Hobart, and was not heard of afterwards.

BLACKALL, clipper ship, from Brisbane to London with wool, was destroyed by fire, 19 April 1865.

BLACK PRINCE, ship, was wrecked on a reef off Arends Island, Torres Strait, 5 August 1882. A naval court was held at Surabaya.

BLACKWALL (26), barge, foundered off Banks Peninsula, New Zealand, February 1889.

BLAIRMORE (223), brig, of Melbourne, was wrecked in Madura Strait, Java Sea, March 1871, on voyage from Surabaya to Melbourne.

BLERVIE CASTLE, ship, London to Adelaide, was last seen on 25 December 1859, then was lost in the English Channel with all hands (57).

BLOSSOM, was wrecked at Chatham Islands, east of New Zealand, 22 July 1842. The crew were saved.

BLUE JACKET (1790), clipper ship, from Lyttelton to Liverpool, was abandoned on fire off the Falklands, March 1869. 36 people were saved after having been a week in a boat, and 3 others after having been 3 weeks in another. 32 lives were lost.

BOANERGES (1236), emigrant ship, left Liverpool, February 1857, and put into Queenstown with cargo shifted; after leaving there she lost her masts and put into Plymouth for repairs in April. Her passengers were then brought on to Sydney in the ship *Vocalist*. *Boanerges* left in July with 470 emigrants and reached Sydney, October 1857.

BOBTAIL NAG (170), brigantine, of Brisbane, engaged in kanaka labour traffic, was wrecked in Villa Harbour, Efate or Sandwich Island (New Hebrides), during a hurricane, January 1878. No lives were lost.

BOLTON ABBEY, was lost in 1851.

BONA VISTA, ship, was wrecked on Kenn Reef, Coral Sea, on voyage via Torres Strait, from Sydney to the Mauritius, 18 March 1828. A strong current set the vessel on to a reef during the night, and she was completely wrecked in 3 minutes.

BONNIE DOON, whaler, was wrecked, 5 June 1864, on Rowe Reef, Banks group. All were saved.

BONNIE LASSIE (350), barque, of Fremantle, was wrecked in Sunda Strait, December 1885.

BOREALIS, Queensland labour schooner, was taken and looted by natives of Malaita, Solomons, October 1880, all but 3 hands being killed. She was recaptured shortly after by crews of 3 other labour schooners who took summary vengeance on the natives.

BOROUGH BELLE (210), brigantine, was wrecked on Bellona Reefs, Coral Sea, 20 January 1894. The crew left in 2 boats and sailed safely across to Queensland.

BOTHWELL CASTLE (592), barque, of Newcastle, was wrecked at Magarik Island, Caroline group, December 1884, through thick weather, error in chronometer, and unusual current.

BOURNEUF (1494), ship, brought emigrants to Geelong in February 1853 and, whilst lying there, all excepting 4 of her crew of 58 men deserted to go to the goldfields. After several months she left Geelong for India and was wrecked near Torres Straits on 3 August 1853, with loss of 7 lives.

BOVERIC, s.s., in 1902 lost her propeller in the South Indian Ocean, about 2000 miles from Western Australia. After several weeks' drift she was picked up and towed into Fremantle.

BRAZILEIRA (294), barque, of Sydney, was wrecked on the China coast, November 1893.

BRECHIN CASTLE, ship, from South Australia, was wrecked in 1847.

BREEZE, schooner, of Hobart, was wrecked on a reef near Apia, Samoa, July 1846, and was plundered by Samoans. The crew were saved. The Samoans subsequently returned their plunder.

BRENDA (2000), ship, arrived at Valparaiso from Newcastle and was found to be on fire, 12 June 1906. She was completely burnt out.

BRIGAND, brig, sandalwood trader owned by Padden of Sydney. In November 1843, in a fight with natives of Mare, Loyalty group, 17 of the crew were killed, but the remainder escaped with their vessel.

BRISBANE, a new river s.s. for Australia, was lost on her voyage from England in 1855.

BRITAIN'S PRIDE (178), brig, of Wellington, became missing, June 1876.

BRITISH COMMERCE (1417), ship, London to Melbourne with general cargo, sank after collision with the ship *County of Aberdeen* in the English Channel, 24 April 1883, with loss of several lives. *County of Aberdeen* was to blame for not having given way to her.

BRITISH NAVY (1216), ship, from London to Sydney, when at anchor in the Downs (eastern coast of Kent), had her cables parted in a gale, and she drifted on to the *Lanarca* and sank in a few minutes, nearly all hands being drowned, 27 November 1881.

BRITISH SOVEREIGN, sandalwood barque, owned by Ben Boyd, was wrecked, April 1847, on the south-western side of Efate Island, New Hebrides. The crew reached the island safely, but were afterwards all killed by natives, who ate 10 of them at once, and the rest later. Only 2 escaped.

BRITON, English whaling ship, was wrecked on Christmas Island, October 1836, and all hands remained on the island until rescued, May 1837.

BRITON (776), transport ship, with a portion of the 80th Regiment from Sydney to Calcutta, after leaving Singapore, was driven high on shore on one of Andaman Islands during a hurricane, 13 November 1844. 431 men were aboard, but no lives were lost. 300 yards from her was also wrecked the transport *Runnymede*, England to Calcutta.

BROXTON (2664), s.s., of Lyttelton, was converted into a hulk, January 1924.

BRUCE (205), s.s., of Dunedin, was wrecked at Tairoa Head, New Zealand, October 1875.

BRUNNER (358), s.s., was wrecked at Apamana Island, Gilbert group, 22 May 1915.

BUCKHURST (1897), ship, was totally burnt at sea, 9 May 1897, on voyage with coal from Newcastle to Panama.

BUFFALO, H.M.S., was wrecked in Mercury Bay, New Zealand, 28 July 1840. She had been employed as a storeship on Australian and New Zealand service. 2 lives were lost.

BUGOTU (29), ketch, of Suva, was wrecked in the Solomon Islands, December 1914.

BURTON STATHER (422), barque, of Sydney, was

wrecked on a voyage to China. She became missing with all hands, January 1877.

CAIRNBULG (1567), Duthie's Australian clipper ship, built in 1874, sold to Russians and renamed *Alexandra*, left Newcastle, New South Wales, with coal for Panama, and on 8 May 1908, was abandoned only because provisions were running out. Later she was found wrecked on Albemarle Island, Galapagos group, 17 August 1908.

CAIRNDHU (161), schooner, of Newcastle, was wrecked in the New Hebrides, July 1887.

CALEDON, 3-masted brigantine, from Newport (Monmouth) to Tasmania with steel bars, was abandoned and foundered at sea, 12 May 1883. The cause was navigation and premature abandonment.

CALLIOPE, H.M.S., was the only vessel which escaped from Apia, Samoa, during the hurricane of 16 March 1889, when were wrecked the U.S.A. war vessels *Trenton*, *Vandalia*, and *Nipsic*, and the German war vessels *Eber*, *Adler*, and *Olga*, 130 lives being lost. *Nipsic* and *Olga* were refloated later. *Calliope* steamed safely out and reached Sydney.

CAMDEN, ship, from Sydney to Surabaya, was wrecked on a reef near Madura Island, Java, 11 August 1835, in company with the ship *Charlotte*.

CAMILLE (221), brig, of Dunedin, foundered in Foveaux Strait, south of New Zealand, November 1892.

CAMPADRE, brig, was wrecked on Auckland Island, south of New Zealand in 1890.

CANADIAN IMPORTER (5500), Canadian government s.s., trading to Australia, was abandoned in distress in the North Pacific, October 1921. The crew were saved in boats; the ship was picked up by tugs off the American coast and towed to Vancouver Island.

CANNY SCOT (328), barque, of Newcastle, was wrecked off Cochin China, January 1881.

CANTON whale-ship, struck on Minerva Reefs, near 24° S., 179° W., August 1854.

CAPE PACKET, brig, sandalwood trader from Sydney, was captured and destroyed by natives of Vila, New Hebrides, about 1845, all the crew being killed.

CARAWA, Australian Commonwealth Line, was on a passage from U.S.A. to Australian ports, and shortly after leaving Panama picked up a launch, which she towed in to the Galapagos Islands. In leaving the island she struck a reef and became a total loss, 24th March 1920.

CARDINIA (1915), ship, of Sydney, formerly the German ship *Olinda*, seized in Newcastle by the Commonwealth in August 1914, was wrecked on a reef off Mumbualah Island, Fiji, just after dark, September 1921. No lives were lost. She left Sydney for Fiji for a cargo of copra.

CARIBOU (1160), Shaw Savill ship, with emigrants to New Zealand, was burnt at sea in 1869.

CARL (167), brig, owned and sailed by a scoundrel named Murray, of Epi Island, New Hebrides who engaged in kanaka labour trade to Queensland with the utmost brutality and massacred 60 natives aboard in order to prevent detection by a warship about 1871, was wrecked near Bluff Harbour, New Zealand, July 1874.

CARNARVON CASTLE (1644), formerly the *Red Rock*, on voyage from Liverpool to Melbourne, became on fire, 31 January 1907. The crew left her in 2 boats when 850 miles south-west of Cape Leeuwin. After 24 days in the boats they arrived at Fremantle, two men dying at sea and one after arrival.

CAROLINE, whale-ship, was lost on Minerva Reefs near 24° S. 179° W. to southward of Tonga group, in 1865.

CARRICK (898), barque, of Glasgow, left Newcastle December 1896, for Valparaiso, struck some wreckage, and was abandoned when sinking. No lives were lost.

CARRIZAL, barque, stranded on Baker Island, mid-Pacific, February 1900.

CASSARD (2290), French barque, from Sydney to Falmouth, left Sydney, April 1906, and was wrecked on the Falkland Islands. No lives were lost.

CASTLEBANK (1542), ship, of Glasgow, left Newcastle, September 1896, for Tocapilla, Chile, and was not heard of again. 28 lives were lost.

CASTLEREAGH, schooner, of Sydney, was wrecked during a hurricane, 15 January 1848, in Wreck Bay, Lifu Island, Loyalty group. The crew landed safely.

CASTLE ROCK, ship, from Sydney to North Pacific coast, left, 15 April 1908, and was not heard of again.

CASWELL, ship, in 1899 left Newcastle, New South Wales, for Guayaquil, Ecuador, and was not heard of again.

CATHERINE, sandalwood trader from Sydney, was attacked by natives at the Isle of Pines, New Caledonia, in 1843 and several of the crew were killed. The vessel was damaged, but escaped.

CATHERINE, Norwegian schooner, was wrecked on Crozet Islands, December 1906. The crew were rescued by s.s. *Turakina*, February 1907.

CATLIN (46), ketch, foundered at South Island, New Zealand, September 1894.

CEARA (172), schooner, of Brisbane, was wrecked at the entrance to Losalava Harbour, Santa Maria Island, Banks group, 17 November 1885. She got under way without any sails set.

CELESTIA (225), barque, of Dunedin, became missing, May 1887.

CENTENNIAL (89), s.s., left Launceston for Wellington, 17 October 1906, and was not heard of again. She had a crew of 10 men.

CERES (454), barque, of Melbourne, was wrecked on Bampton Reef, Coral Sea, August 1883. No lives were lost.

CEZAREWITCH (428), barque, of Dunedin, was wrecked about 1874.

CHALLENGE, schooner, Queensland labour vessel, was captured in 1873 by H.M.S. *Basilisk* with 33 kidnapped kanakas aboard. She was condemned at Sydney, but was restored to her owners, as the natives were kidnapped just before the Kidnapping Act was passed.

CHANCE, Queensland labour schooner, was wrecked in 1882 on Tongoa Island, New Hebrides during a hurricane. All were saved.

CHARLES EDWARD, s.s., was wrecked at Wanganui, New Zealand, December 1908.

CHARLOTTE, ship, from Sydney to Surabaya, was wrecked on a reef near Madura Island, Java, 11 August 1835, in company with the ship *Camden*.

CHARYBDIS, Queensland labour schooner, put into Havannah Harbour, New Hebrides, leaking. She transhipped all her people, and was then placed on the mud, where she was wrecked in a hurricane, January 1878.

CHATHAM, emigrant ship, from London to Sydney, was wrecked off Portugal, November 1842.

CHATHAM, brig, was lost on Penrhyn Island, Polynesia, January 1854.

CHEVERT (314), barque, of Sydney, was wrecked at Havannah Harbour, New Hebrides, January 1880.

CHEVIOT (494), barque, Adelaide to Cape Town with wheat, was not heard of after sailing, March 1885. All hands (12) were lost.

CHINA (7912), P. & O. R.M.S., bound to London from Australia, stranded on Perim Island, Gulf of Aden, March 1898. No lives were lost. She was refloated many months later.

CHIPPERKYLE (1598), barque, left Newcastle for Valparaiso, 6 April 1905, and was not again heard of.

CHRISTINE (97), schooner, was wrecked at Waitotara River, New Zealand, September 1894.

CINCINATTI (460), barque, left Newcastle for Otago in September 1862, the notorious Bully Hayes being master. She leaked badly, stranded in Otago Harbour, and was converted into a coal hulk.

CITIZEN, wooden paddle s.s., disappeared on a voyage from Melbourne to Dunedin in 1862. All lives were lost. She was crowded with diggers.

CITY OF AUCKLAND, ship, was lost at the mouth of Otaki River, New Zealand, 22 October 1878.

CITY OF CORK, s.s., stranded on Okura Reef, North Island, New Zealand, 18 April 1883.

CITY OF DUNEDIN (327), s.s., was lost off Taranaki, New Zealand, 20 May 1865. All hands including 15 passengers were lost.

CITY OF LINCOLN (2104), s.s., of Melbourne, was wrecked off South Africa, February 1905.

CITY OF PERTH, later renamed *Turakina*. See *Ben Venue*.

CITY OF SERINGAPATAM (1190), ship, of Glasgow, from London to Melbourne with general cargo, was wrecked, 12 December 1876, on Bonavista Island, Cape Verde Islands.

C.J.S. (664), barque, of Melbourne, was wrecked near the Mauritius, February 1920.

CLAN MACMILLAN (6608), s.s., was totally lost on Table Island, Indian Ocean, 21 June 1924, on voyage from Calcutta to Australia.

CLAN MACPHERSON (1586), iron barque, of Liverpool, left Newcastle, New South Wales, with coal for Valparaiso in 1909, and has not since been heard of.

CLANSMAN (157), brigantine, was wrecked at Gisborne, New Zealand, April 1889.

CLARA SAYERS (294), of Sydney, was wrecked at Rodriguez, Indian Ocean, January 1872.

CLARENCE, brig, of Sydney, was wrecked on Chesterfield Shoal, Coral Sea, 9 June 1844.

CLARINDA (125), schooner, of Auckland, became missing, April 1883.

CLEMATIS (249), brig, of Hobart, was wrecked on Banks Peninsula, New Zealand, 21 February 1881.

CLYDE (401), ship, was abandoned at sea, 300 miles from the Mauritius, 5 August 1836.

CLYDE, of Auckland, stranded on Bartlett's Reef, Hawkes Bay, 20 March 1877.

CLYDE (103), schooner, of Sydney, was wrecked on Ninety Mile Beach, Canterbury Bight, South Island, New Zealand, February 1879.

CLYDE (562), barque, of Newcastle, was wrecked at Duvauchelles Bay, Akaroa Harbour, New Zealand, November 1884. There was only 1 survivor.

CLYDE, s.s., parted her moorings at Suva, drove against the wharf, and foundered, 4 March 1886.

CLYDE (87), schooner, was wrecked at Macquarie Island, South Pacific, November 1911.

COIMBATORE, barque, probably foundered with all hands after collision with the barque *Zinita*, which arrived at Adelaide about February 1906.

COLINTRAVE (1747), ship, of Ardrossan, left Newcastle, March 1894, for San Francisco, and was not again heard of. 31 lives were lost.

COLLEEN BAWN, kanaka labour vessel, Queensland to Solomons, left Ugi (Solomons) about 1870 and was lost with all hands.

COLOMBIA (1281), Norwegian barque, left Wallaroo for Falmouth and became missing with all hands, 27 February 1906.

COLOMBIAN, was lost in Straits of Gaspar, East Indies, in 1845.

COLONIST, for Noumea, was wrecked on Elizabeth Reef, Tasman Sea, 1 January 1870.

COLONIST (43), schooner, was wrecked at Wellington Head, Macquarie Harbour, Tasmania, August 1888.

COLUMBIA RIVER (1064), wooden 4-masted schooner of San Francisco, from Auckland to Portland, Oregon, was wrecked on Sunday Island, Kermadecs, 8 September 1921. All hands landed on the island, and 6 men in a boat sailed to Suva for help. No lives were lost.

COLUMBINE, ship, from London to Sydney, was wrecked on the West African coast, May 1829.

COMET (350), barque, of Dunedin, missing with all hands since February 1875.

CONDOR, ship, Australian trader, was burnt in 1853.

CONSTANCE CRAIG, from New Zealand, became missing with all hands in 1907.

CONSTITUTION, American ship, was wrecked on Middleton Reef, Tasman Sea, in 1859.

COONATTO (633), Anderson's clipper ship, built in 1863, became a total wreck 2 miles west of Beachy Head, 21 February 1876. She sailed between London and Australia until wrecked.

COQ DU VILLAGE (312), barque, of Newcastle, was wrecked at Napier, New Zealand, August 1876.

CORA (46), schooner, was wrecked at Rarotonga, September 1889.

CORINGA PACKET (230), ship, from Sydney for Ceylon, was wrecked on Coringa Islets in Coral Sea, 7 May 1845. Part of the crew reached Port Essington and were there picked up by H.M.S. *Fly*. Others, who remained by her, were taken off later by the schooner *Frolic*. 11 Lascars died.

CORINTH, Walker's composite barque, left Launceston for London in 1890, took fire 300 miles southeast of New Zealand, and was abandoned. The crew in 2 boats were picked up safely 5 days later.

CORNUBIA, old s.s. bought by Paddon in Sydney, was taken to Anelcahaut, Aneityum, New Hebrides, where her engines were removed to a shore establishment and her hull was wrecked on the reef, about 1843.

COSPATRICK, Shaw Savill emigrant ship, sailed from London to Auckland, September 1874, with 429 passengers and 44 crew. When south of the Cape of Good Hope, she caught fire, 18 November, panic broke out, and only 2 boats got away safely. They stayed near until next day, when she sank blazing. No provisions and few oars were in the boats. All the occupants perished except 3, who were picked up by the *British Sceptre* on the 28th.

COSTA RICA PACKET, ship, left Sydney on a whaling cruise, July 1891, and was arrested for piracy by the Dutch in the East Indies. When released, she was sold at Singapore to pay costs. In 1897 the Dutch paid £10,000 compensation.

COUNTESS OF RANFURLY (153), schooner, was wrecked at the Isle of Pines, New Caledonia, 31 March 1910.

COUNTY OF AYR (498), barque, was wrecked off Otago, New Zealand, in a dense fog, October 1905. The crew were saved in a boat.

COUNTY OF ROXBURGH (2091), 4-masted barque, from Chile to Sydney in ballast, was wrecked in a cyclone on Takaroa Island, Paumotu group, 8 February 1906. 10 lives were lost.

COWDEN LAW, ship, on voyage from Newcastle to San Francisco, was abandoned on fire, 20 January 1885, in 34° N. 128° W. There had been a spontaneous combustion of coal.

CRAIGIE LEA, wooden ship, met with an accident off the Crozets, South Indian Ocean, in 1878. Inquiry was held at Fremantle 11 June 1878, but no one was held to blame.

CREST OF THE WAVE (112), schooner, of Sydney, foundered in Foveaux Strait, south of New Zealand, April 1894.

CRISHNA, barque, Queensland labour vessel, was captured by H.M.S. *Basilisk* with kidnapped natives aboard, and was condemned and sold in 1873.

CROESUS, s.s., was burnt in 1855. She had arrived at Sydney in April 1854.

CROMARTYSHIRE (1462), ship, a well-known Australian trader, was wrecked near Antofagasta, November 1906. No lives were lost.

CUMBRAE (1360), ship, of Greenock, left Newcastle, February 1895, for Valparaiso, and was not heard of again. 23 lives were lost.

CYGNET (46), schooner, of Levuka, was wrecked, March 1910.

CYRENA (2618), s.s., loaded with case oil, struck the bar and stranded as she was entering Wanganui, New Zealand, 24 May 1925. She was refloated, but, being much damaged, was again beached, 10 June, when she became a total wreck.

CYRUS (317), barque, of Wellington, was wrecked in Cook Strait, New Zealand, March 1874.

DACCA (2545), s.s. with passengers from London for Queensland, was wrecked on a reef in the Red Sea, 16 May 1890. No lives were lost.

DAISY (53), schooner, of Auckland, was wrecked at Tonga, January 1890.

DALGONAR (2665), ship, became on fire when bound to Australia, and put into St. Vincent, Cape Verde Islands, 18 July 1896. On 13 October 1913 she was abandoned in 29° S., 87° W., her shingle ballast from Callao having shifted. 4 lives were lost.

DALHOUSIE (800), frigate-built ship, launched at Moulmein in 1848, left London for Sydney, October 1853, and when off Beachy Head went on to her beam ends in a heavy gale and slowly foundered. There was only one survivor out of about 60 people.

DANAE, H.M.S. While employed in surveying in the Solomon group, Lieutenant St. Clair Bower and a boat's crew of 4 men were murdered on Mandoliana Island by natives from Florida Island, November 1880.

DANCING WAVE, pearling vessel, engaged labourers on Florida Island, Solomons, 22 April 1876, but all the crew were murdered by natives except one man, who with the help of other natives sailed her away and was rescued by the barque *Sydney*.

DAPHNE, schooner, kanaka labour trade, was seized by H.M.S. *Rosario* as a kidnapper in 1869.

DARLING DOWNS (1634), built in 1852 as s.s. *Calcutta* (iron), was converted into a sailing ship and made many voyages to Sydney. She sank in collision off the Nore in 1887.

DASHING WAVE, barque, of Sydney, from Foochoo to Sydney with tea, struck a reef in the China Sea, 31 August 1870. The crew were 31 days in boats with few provisions and reached Strong's Island or Kusaie, Carolines, in October.

DAVID AND JESSIE (142), schooner, of Melbourne, was wrecked at Colombo Roads, September 1870.

DAYSPRING (120), the first, brigantine, Presbyterian mission vessel, Australia to New Hebrides, was wrecked on a reef at the entrance to Anelcahaut Harbour, Aneityum, 6 January 1873, having been blown out of the harbour by a hurricane. All hands were saved. The wreck was sold to a Frenchman and was repaired and refloated, to be engaged in kanaka labour trade, but before leaving the harbour another heavy gale again drove her on to the reefs, totally wrecking her, in 1873.

DAYSPRING (160), the second, 3-masted schooner, built in Sydney in 1872 and named *Paragon*, was bought by the Presbyterian mission and renamed in 1873. She continued in mission service, Australia to New Hebrides, until 1894.

DAYSPRING, the third and last, auxiliary 3-masted schooner, s.s., Presbyterian mission vessel, arrived at Melbourne, December 1895. On 16 October 1896 she was wrecked at the entrance to Grand Passage, north of New Caledonia, on voyage from Sydney to New Hebrides. All hands left her in 2 boats as she sank, and sailed safely in them back to Australia.

DEFENDER (1300), ship, of Boston, U.S.A., from Puget Sound to Sydney with timber, was wrecked on Middleton Reef, Tasman Sea, 27 February 1859. 2 boats arrived at Macleay River, and 1 at Port Macquarie. There was no loss of life.

DEFENDER (109), s.s., of Sydney, was burnt at Wellington, August 1918.

DEFIANCE (199), barquentine, sailed from Newcastle to Kaipara, where she was wrecked, 28 August 1906. No lives were lost.

DELAWARE, barque, from Newcastle, New South Wales, was destroyed by fire caused by spontaneous

combustion, 25 November 1881. A naval court was held at Valparaiso.

DELMIRA (338), schooner, was wrecked at Cape Palliser, New Zealand, 8 December 1896.

DERRY CASTLE (1307), ship, stranded and was wrecked on Enderby Island, off Auckland Island, south of New Zealand, 20 March 1887. 16 lives were lost, including the master and all mates.

DERWENT (221), brig, of Lyttelton, was wrecked in Lyttelton Harbour, New Zealand, in 1898.

DEVON, s.s., was wrecked at the entrance to Port Nicholson, Wellington, 25 August 1913.

DIAMOND (391), barque, of Melbourne, was wrecked at Malden Island, June 1888.

DISPATCH, ship. See Section II.

DOCKENHUDEN, Hamburg ship, was lost on Cato Reef, Coral Sea, in 1853.

DOELWYCK (740), Sydney to Batavia. During the night of 21 April 1854, when she was in company with *Hester*, both ships were wrecked on Kenn Reef, Coral Sea. The crews left in boats, but nothing was heard of those of the *Doelwyck*. See *Hester*.

DON NICOLAS, barque, Newcastle to New Zealand, foundered 13 March 1891.

DORIS (30), ketch, was wrecked in the Solomon Islands, April 1912.

DOUGLAS (380), barque, of Melbourne, was wrecked on Elizabeth Reef, Tasman Sea, 8 May 1859.

DOUGLAS, schooner, of Melbourne, was wrecked at Stewart Island south of New Zealand, May 1878.

DOUGLAS (178), schooner, was wrecked on Koro Island, Fiji, in thick weather, 28 July 1884.

DOURO (40), stern-wheel steamer. At Brooker Island, SE. New Guinea, the 4 white members of the crew were killed by natives, 16 November 1878.

DREAM (32), cutter, was wrecked at Tauranga Heads, July 1893.

DRUMCRAIG (1979), 4-masted barque, previously of Liverpool, sold to British Columbia, became missing about 1910, while on the way from Newcastle to western coast of South America.

DUKE OF SUTHERLAND, ship, while loading at Timaru for England, 3 May 1882, was totally lost by stranding in a gale of wind. Insurance litigation lasted over three years.

DUKE OF WESTMINSTER (2426), s.s., Brisbane to London with general cargo, stranded on Atherfield Ledge, Isle of Wight, 3 January 1884, through navigation in thick weather.

DUMFRIESSHIRE (1262), barque, Wellington to New Caledonia, stranded on a reef in Gazelle Passage, New Caledonia, 3 July 1904, and was abandoned in the evening. During the night she floated over the reef towards the coast and was found by 2 Frenchmen, who boarded her and took her safely to anchorage. In August she was brought to Sydney to be repaired.

DUNCAN DUNBAR (1374), was built in 1857 for D. Dunbar and was in the Australian trade until 1865, when, being outward bound from London, she was wrecked on the Las Rocas Shoal off Brazil, 7 October 1865. All hands (116) were landed on the sand islet and rescued.

DUNDEE MERCHANT, was lost at New Caledonia in 1846.

DUNDONALD (2205), 4-masted barque, left Sydney for Falmouth, February 1907, with a cargo of wheat, and became missing with all hands (28).

DUNEARN, British ship, sold to Norway, left Newcastle, New South Wales, with coal for the western coast of South America in 1910 and became missing with all hands.

DUNEDIN (66), schooner, foundered on the western coast of New Zealand, July 1894.

DUNKELD, barque, left Newcastle, June 1870 and became missing with all hands.

DUNNOTTA CASTLE, ship, was wrecked on Ocean Island, mid-Pacific, 15 July 1886. The cause of stranding is unknown. 7 seamen sailed 1200 miles in an open boat to Honolulu, taking 52 days.

DUNSELAW, ship, was abandoned justifiably at sea, 11 August 1882. Inquiry was held at Adelaide.

DUROC, French war s.s., was wrecked on Mellish Reef, Coral Sea, August 1856. The crew proceeded in boats to Timor.

EARL OF SOUTH ESK, barque, of Melbourne, was wrecked on Wellington Heads, New Zealand, May 1874.

EARL OF ZETLAND (1461), ship, from London for Melbourne, was wrecked in English Channel off Dungeness, 4 December 1894.

EARLSCOURT, ship, from South Australia to Falmouth with wheat, put into the Mauritius, March 1904, dismasted and damaged. She was repaired and sailed again in June.

EARLY DAWN, ship, was wrecked on a voyage from Brisbane to London, 29 December 1869.

EASTERN CITY, emigrant ship to Melbourne, was burnt at sea between the Equator and the Cape of Good Hope, August 1858. No lives were lost.

EDITH MAY (213), schooner, was wrecked at Wanganui, New Zealand, July 1892.

EDWARD VITTERY, schooner, was lost on Tristan d'Acunha Island, 8 March 1881, being driven ashore from her anchorage by heavy sea. Inquiry was held at Melbourne.

EDWIN BASSETT (397), barque, of Wellington, was wrecked at Wanganui, New Zealand, 31 August 1885, through the wind falling light when the vessel was too near the shore.

EGYPT, barque, from Sydney, was lost on the China coast, 8 September 1857. All hands but one were lost.

EILLAN DONAN (261), brigantine, of Auckland, was wrecked on Chesterfield Reefs, Coral Sea, December 1893.

ELDERSLIE (203), schooner, of Dunedin, was wrecked at Oamaru, New Zealand, May 1875.

ELEANOR, brig, was lost at Yule Island, New Guinea, May 1846.

ELIBANK CASTLE (100), barquentine, had her master, mate, and 3 seamen killed by natives of Rendova (Solomons), who wanted their heads, in 1885.

ELINGAMITE (1675), s.s., from Sydney to Auckland, was wrecked at Three Kings Island, New Zealand, 5 November 1902. 30 lives were lost. As an outcome of this wreck there was formed The National Shipwreck Relief Society of New Zealand.

ELIZA, English barque, was lost off Mud Point, Hooghly River, when bound from Melbourne to Calcutta, 29 April 1854.

ELIZA AND U. CAMERON (41), schooner, was wrecked at Bluff Harbour, New Zealand, May 1889.

ELIZABETH, ship, of London, was wrecked on Elizabeth Reef, Tasman Sea, in 1831. The cutter *Fanny* was sent out from Sydney to examine the wreck and reef.

ELIZABETH, was wrecked on Elizabeth Reef, six miles north of Tutukaka, North Island, New Zealand, probably about 1840.

ELIZABETH, schooner, was lost on Chesterfield Reefs, Coral Sea, in 1844, while salving the wreck of the brig *Clarence*. The crew reached Queensland in boats.

ELIZABETH (349), barque, of Lyttelton, became missing, April 1885.

ELIZABETH (33), ketch, was wrecked at Whangarei, New Zealand, November 1889.

ELIZABETH, sandalwood barque, was wrecked in a gale in Elizabeth Bay (near Dillon Bay), Erromango, New Hebrides, in February 1848. All the crew either perished on the wreck or were killed by natives directly they landed.

ELIZABETH CURLE, schooner, was wrecked on Cuvier Island, New Zealand, 29 July 1882, through navigating too close to lee shore.

ELIZA CAMPBELL, barque, was justifiably abandoned in 39½° S., 78° W., 5 September 1884, on account of damage in heavy weather.

ELIZA K. BATESON (163), brig, of Sydney, foundered off Rotumah Island, mid-Pacific, August 1876.

ELIZA MARY (161), schooner, of Maryborough, was wrecked near Port Stanley, Malekula, New Hebrides, during a hurricane, March 1890.

ELLENITA (318), brig, commanded by the notorious scoundrel W. H. ('Bully') Hayes, while on voyage from San Francisco to Sydney foundered, 16 October 1859, near Samoan group. All were saved in boats and raft, and eventually arrived at Sydney.

ELLEN MORRIS (195), brig, of Sydney, was wrecked at Bulari Passage, near Noumea, New Caledonia, July 1874.

ELLESMERE, barque, was lost on Ngau Island, Fiji, 15 March 1869.

ELLISLAND (2355), 4-masted barque, of Liverpool, left Newcastle, New South Wales, with coal for Caldera, Chile, in 1910 and was never heard of again.

ELLON CASTLE (328), barque, of Sydney, was wrecked on New Chwang River Bar, China, November 1870.

ELVERLAND (361), brigantine, was wrecked at Three Kings Island, north of New Zealand, December 1906. No lives were lost.

EMERALD (745), barque, from Newcastle to Kaipara, was wrecked near Kaipara, New Zealand, in a fog, June 1905. There was no loss of life.

EMILY (268), brig, of Sydney, sunk in Likiliki Harbour, New Zealand, September 1881.

EMILY (190), brig, was wrecked in Malo Pass, Santo, New Hebrides, 29 March 1885, through navigating an unsurveyed channel, strong tides, and light breeze.

EMILY, ketch, of Queensland, was captured by natives of Joannet Island, Louisiades, SE. New Guinea, who killed the crew of 8 men, 14 September 1886, while pearl shelling. She was looted and burnt.

EMILY MILLER (28), ketch, of Levuka, was wrecked at Kandavu Island, Fiji, December 1892.

EMILY REED, U.S.A. ship, from Newcastle for Portland, was wrecked on the Oregon coast, 14 February 1908. 9 lives were lost.

EMMA COLVIN (560), ship, Sydney to New Caledonia with cattle, was wrecked on reefs south of Noumea, 12 November 1863. All hands were saved.

EMMANUEL, was wrecked on Mara Reef, north of Noumea.

ENDEAVOUR, Australian Fisheries Investigation s.s., left Melbourne for Macquarie Island, South Pacific, with the director of fisheries and his staff. She left Macquarie Island on her return voyage, 3 December 1914, and no trace of her has since been found. 24 lives were lost.

ENHIALTES, barque, was wrecked in Fiji group, 26 July 1894.

ENSIGN (315), barque, was wrecked on Herald Surprise Reef, Coral Sea, April 1888.

ENTERPRISE, schooner, was wrecked at Hokianga, New Zealand, with all hands lost, 5 May 1828.

ENTERPRISE, schooner, had her mate and 3 seamen killed and eaten by natives of Rendova (Solomons), 29 October 1889.

EOTHEN (225), brig, Middlesborough to Sydney with pig-iron, stranded at Milford, Wales, 3 March 1881. The master was blamed for running her ashore without sufficient cause; his certificate was cancelled.

EPI (39), auxiliary schooner, of Sydney, was wrecked at New Caledonia, 2 June 1914.

EQUATOR, Batavian ship, was burnt and wrecked in 1859.

ERROL, barque, Norwegian, from Peru to Newcastle, was wrecked at midnight on Middleton Reef, Tasman Sea, 18 June 1909. During the next weeks 17 lives were lost in horrible misery from starvation and thirst. S.S. *Jofua* saved 5 survivors, 12 July.

ESPECULADOR (262), barque, of Auckland, was wrecked on Lefuka Reef, Tonga Islands, August 1883.

ESPERANZA, Queensland kanaka labour vessel, had all her crew murdered by natives of Kulambangra, Solomons, in 1880.

ETHEL (500), barque, from London for Brisbane, was sunk by collision in English Channel, off Portland, 25 June 1890. 4 lives were lost.

EUDORA, barque, was lost in Poverty Bay, New Zealand, 26 July 1851.

EUGENIE (34), schooner, of Sydney, was wrecked in the Gilbert Islands, September 1914.

EURYALE, French transport, was wrecked in 1870 on Starbuck Island, mid-Pacific Ocean, near 5½° S., 156° W.

EURYNOME (1346), ship, from Geelong to Havre with wheat, is supposed to have foundered at sea with all hands about April 1882. Probably she was overladen.

EXPRESS (199), s.s., of Dunedin, was wrecked at Riverton, New Zealand, March 1877.

FALCO, American brig, was wrecked and pillaged in New Zealand, 1845.

FALCON, whaler, was wrecked on Ascension Island or Ponape, Caroline group, July 1836.

FALCON, ketch, foundered at sea off New Zealand, 27 February 1884.

FALLS OF GARRY (2088), 4-masted barque, stranded on a reef off New Caledonia, July 1898. She was refloated one year later, towed to Sydney, repaired, and refitted in 1899. On a voyage from Port Pirie to Queenstown (Ireland) she was totally wrecked on the Irish coast, April 1911.

FANNY, brig, sandalwood trader to Auckland, was wrecked on a reef near Somo-Somo, Fiji, June 1850. The crew reached Viwa safely in boats, were taken aboard the mission vessel *John Wesley*, and brought to Sydney.

FANNY, Queensland labour vessel, had all her crew killed by natives of Nguna, New Hebrides, July 1871.

FANNY MERRIMAN, clipper ship, of Sydney, was wrecked on Christmas Island, mid-Pacific, 17 June 1864. All hands were saved.

FAVORITE, South Sea whaler, was wrecked on Desolation Island, Kerguelen Island, in 1849.

FAVORITE, barque, was wrecked in Apia Harbour, Samoa, 6 April 1850. During a severe hurricane she drove from her anchorage, fell foul of the American ship *Hercules*, cleared her, and struck on reef.

FAVOURITE, H.M. sloop, 18 guns, assisted Christian natives of Tongatabu to attack their enemies of Bea, 24 June 1840. The natives deserted the British, who therefore lost heavily, the commander being among the killed.

FEDERATION (187), brig, of Lyttelton, became missing with all hands, and is supposed to have foundered in 1875.

FELICITY (24), ketch, was wrecked at Wellington, September 1910.

FELIXSTOWE, was wrecked near Otaki Beach, Cook Strait, in 1878.

FERDINAND FISCHER (1673), German ship, left Geelong for Falmouth, 5 February 1906, and was not heard of afterwards.

FERNMOUNT (183), s.s., was wrecked in the Gilbert group, December 1907.

FERONIA (315), brig, of Melbourne, was wrecked at North Head, Kaipara, New Zealand, 16 May 1877.

FIERY STAR, originally *Comet* (1361), wooden clipper ship built in 1851, Black Ball Line, from Brisbane to London, caught fire, 20 April 1865, when south-east of New Zealand. Passengers and crew, numbering 78, left in 4 boats. The chief officer, 4 seamen, and 13 apprentices stayed aboard and for 21 days vainly fought with the fire, when they were rescued by the *Dauntless*. The occupants of the 4 boats were never again heard of.

FIFESHIRE (1318), barque, of Glasgow, struck an uncharted reef in the Gilberts and was abandoned, 8 August 1908. The crew arrived in Sydney in October.

FIJIAN (633), s.s., of Sydney, was wrecked on Fijian Beach, near Lenakel, western coast of Tanna, New Hebrides, May 1889, during a fine night. No lives were lost.

FIONA, s.s., stranded in Suva Harbour, Fiji, and broke her twin screws, 14 May 1885, through want of prudence when entering harbour on misty night.

FITZROY (128), s.s., of Sydney, was wrecked in Korotoga Pass, Viti Levu, Fiji, June 1876.

FLIRT, brigantine, was wrecked at Savau, Samoa, 31 March 1885. A squall struck her as she was getting under way.

FLODDEN (337), barque, of Melbourne, was wrecked at Shanghai, August 1883.

FLORA, brigantine, stranded on Astrolabe Reef, Fiji, 14 February 1886. The chronometers blamed for the casualty.

FLORA P. STAFFORD (1352), ship, of Nova Scotia, left Newcastle, June 1895, for Manila and was abandoned on fire. No lives were lost.

FLORAL STAR (243), schooner, of Adelaide, was wrecked on the coast of Shantung, China, April 1880.

FLORENCE (809), ship, of Glasgow, left Newcastle, January 1895, for Panama, and was not again heard of. 21 lives were lost.

FLORENCE NIGHTINGALE (464), barque, of Melbourne, was wrecked at Saigon, Cochin China, December 1881.

FLORENCE TREAT (724), barque, of Sydney, was wrecked on a voyage to China, 8 September 1893.

FLYING BUCK, schooner, of Melbourne, was wrecked at Formosa Island, October 1869.

FLYING SPUR, barque, was lost near Cape Town, February 1881.

FLYING VENUS (1660), barque, of Liverpool, was wrecked on a reef north-east of Tongarewa or Penrhyn Island, Polynesia, 6 September 1889.

FOAM, Queensland labour schooner, from Dungeness to Solomons, was lost on Myrmidon Rock, Great Barrier Reef, about 1890. All hands safely returned to Townsville.

FOREST HALL (2500), ship, from Newcastle to South America, was wrecked on Cape Maria Van Diemen, New Zealand, 28 February 1908. No lives were lost.

FORMOSA (380), barque, of Melbourne, was wrecked in the Philippines, October 1875.

FORTUNATUS (3426), s.s., of Melbourne, from Calcutta to Melbourne, took fire when 4 days from Colombo and was abandoned, July 1907. All her people in boats were picked up by s.s. *Forth* and landed at the Mauritius.

FORTUNE, brig, of Sydney, was wrecked on the New Zealand coast with loss of all hands (10) about 1871.

FRANCE (3942), 5-masted barque, was abandoned off Cape Horn, 13 May 1901.

FRANCE (5633), 5-masted ship, was wrecked on Mara Reef, sixty miles north of Noumea, New Caledonia, July 1922, and became a loss. All hands were saved.

FRANCIS, ship, Sydney to Surabaya, was wrecked on a reef near Madura Island, near Java, in 1835.

FRANCISCO FELIX (258), brigantine, of Sydney, became missing, July 1886, when she left Sydney for the Gilbert Islands and was not heard of again.

FRANCOIS COPPÉE, ship, on voyage from Newcastle for San Francisco, was wrecked in Tomales Bay, north of San Francisco, on 13 November 1903. 19 lives were lost.

FREDERICK, convict brig, was seized by convicts in Macquarie Harbour, Tasmania, January 1834. They sailed to Valdivia, South America, where they scuttled the vessel.

FREDERICKA WHILHILMINA (212), kanaka labour brigantine, of Brisbane, was wrecked in Empress

Augusta Bay, Bougainville, Solomons, several of her crew being killed by natives, March 1884.

FRIENDSHIP, schooner, was lost at Norfolk Island, 14 May 1835. All were saved.

FRIENDSHIP (85), schooner, of Sydney, was wrecked in the New Hebrides, August 1892.

FRINDSBURY, whaling vessel, was wrecked on Frindsbury Reef, north of Solomons, March 1832. 3 men were lost in getting 2 boats clear with 32 men. One of these boats was never heard of again; the other after great hardships reached New Britain, where the survivors lived with natives until taken away in May by the *Isabella*.

FRUITER, barque, of Sydney, was wrecked near Noumea, New Caledonia, September 1870.

FUSILIER, barque, was lost on Turakina Beach, New Zealand, 16 January 1884, through heavy weather.

GAEL (98), schooner, of Auckland, was wrecked near Port Stanley, Malekula, New Hebrides, February 1889, during a hurricane.

GAEL (1949), French barque, London to Hobart, began leaking and was abandoned in a sinking condition 200 miles from Cape Leeuwin, 22 August 1909. The crew arrived safely at Fremantle.

GARONNE, s.s., of Liverpool, from Adelaide to London with cargo and passengers, stranded in the southern bay of Ras Hafun, East Africa, 6 June 1878. 2 lives were lost. She was refloated 3 days later, very little damaged.

GARSTON (1812), ship, of Liverpool, was wrecked in the South Sea islands in 1890.

GAZELLE (336), barque, of Invercargill, was wrecked at Nelson, 3 February 1894.

GAZELLE, schooner, was wrecked near the Caroline Islands in 1856, and became a total loss. The crew were murdered by natives.

GEM, was lost on Chatham Islands, east of New Zealand, September 1842.

GEM (20), schooner, was wrecked at Hauraki Gulf, New Zealand, November 1914.

GENERAL GRANT, American ship, from Melbourne to London with passengers and gold, was wrecked on Auckland Island. On a dark night she sailed into a cleft in the cliffs, where she sank, May 1866. Out of 83 souls only 15 landed on Disappointment Island, and were not rescued until 18 months later, when but 10 were living.

GEORGE BUCKHAM, barque, was lost in the Caroline group, 30 May 1851.

GEORGE NOBLE (253), schooner, was wrecked in the Gilbert group, October 1890.

GEERTRUIDA GERARDA, Dutch barque, was abandoned whilst on voyage from Java to Newcastle in May 1902. Her crew were all picked up. She drifted ashore near Tamatave and was totally wrecked.

GILBERT ISLANDS (245), schooner, was wrecked at Levuka, Fiji group, November 1919.

GIROLA (13), cutter, was wrecked in the Fiji Islands in 1913.

GIRVAN (694), barque, from Glasgow to Adelaide with general cargo, stranded on Clachen Rock, Rathlin Island, Ireland, 5 July 1884, through carelessness of pilot.

GIRVAN, barque, foundered after a heavy gale off Auckland, 15 August 1893. All hands (20) were gallantly rescued by the crew of the *George Thompson* in a rough sea.

GLAMIS CASTLE, s.s., stranded on a shoal near Stokong Island, NW. of Borneo, 30 June 1878.

GLASLYN (372), barque, of Melbourne, was wrecked in Ombay Pass, New Caledonia, February 1887.

GLEN ALBYN, 3-masted schooner of Hull, was lost at Huon Island, north of New Caledonia, 6 September 1877. The locality being unsurveyed, the master was exonerated.

GLENFINLAS (2148), ship, of Liverpool, left Newcastle for Manila, October 1897, and was not heard of again. 30 lives were lost.

GO-AHEAD (129), s.s., was wrecked at Hawkes Bay, New Zealand, 2 May 1887, while entering Gisborne.

GOLDEN FLEECE, barque, from Sydney to Calcutta for England, left Sydney, August 1871, was reported by signal off the Bluff, South Africa, but was not heard of again. She is supposed to have struck the Aliwal Shoal off Green Point and foundered with all hands.

GOLDEN FLEECE, ship, of Greenock, was wrecked at Fly Island (Sandalwood Island), East Indies, 27 December 1885. Several lives were lost.

GOTHIC (7755), White Star s.s., from Australia and New Zealand to Liverpool, became on fire and, after burning several days, was beached at Plymouth, June 1906. She was afterwards refloated. Enormous damage was done to cargo and ship.

GRACE DENT (98), schooner, of Sydney, was wrecked at Wanganui Heads, New Zealand, February 1895.

GRAFTON, schooner, was wrecked on Auckland Island, south of New Zealand, in 1864. She was built of northern river hardwood, and after being under water many years was driven up on shore, where she still lies.

GRAFTON, s.s., stranded on Kahurangi Head, New Zealand, 17 February 1885, through misjudging her distance off the land.

GRASSMERE (423), barque, of Sydney, was wrecked at Sinclair Head, near Cape Terawhiti, New Zealand, 25 December 1895. The crew were picked up safely from their boats.

GREAT ADMIRAL (1576), U.S.A., wooden ship, owned by E. R. Sterling, was wrecked off Cape Flattery, U.S.A., 6 December 1906.

GREAT QUEENSLAND (1698), iron ship, of London, London to Melbourne with 70 passengers and crew and general cargo, became missing with all hands, not being heard of since 12 August 1876. Probably there was spontaneous combustion of impure wood powder. The Patent Gunpowder Co. and also her owners were to blame.

GRECIAN BEND (216), brigantine, foundered at Hawkes Bay, New Zealand, April 1894. Several lives were lost.

GRIFFIN (48), schooner, was wrecked at Keakaro, New Guinea, in 1914.

GRIMENEZA, Peruvian ship, from China to Peru, was wrecked on Bampton Reef, Coral Sea, 4 July 1854. 650 Chinese coolies were lost. The master and 3 others were picked up from a boat by the whaler *Australian*.

GUIDING STAR (2012), wooden clipper ship, chartered by Golden Line, left Liverpool, 9 January 1855, and was lost with all hands about February or March 1855, while bound for Melbourne. She is supposed to have been embayed by sailing into a huge ice island in about 44° S., 25° W. 480 passengers were lost.

GUIDING STAR (415), barque, of Sydney, was burnt at sea, 1900 miles from south-western Australia, 22 October 1872.

HALCYON (674), American brig from California to Sydney with flour, was wrecked on North-west Reef, 14 November 1857, having left in March.

HALCYON, s.s., of Dunedin, was lost on Monkey Rocks, Orepuki Bay, New Zealand, 14 February 1877, through accident to machinery.

HALLIE JACKSON, was wrecked at Cape Lisburn, Santo Island, New Hebrides, about 1875.

HAMBURG (1790), barque, from Melbourne to Cork with wheat, ran ashore during heavy weather in Dublin Bay, 28 October 1925. A lifeboat rescued the crew of 45.

HANNAH BARRATT, ship, of Wellington, was wrecked on rocks at the entrance to Tory Channel, Cook Strait, 10 January 1872. She became embayed and could not be worked out. No lives were lost.

HANNAH BROOMFIELD (120), brigantine, of Wellington, was wrecked at Wellington, October 1880.

HARLECH CASTLE (1802), ship, from Newcastle to Carrizal, Chile, South America, struck a rock at that place and sank while proceeding to her moorings, July 1905.

HAROLD (30), schooner, of Sydney, was wrecked in the New Hebrides, June 1893.

HARRIET, was wrecked, presumably on Argo Reef, Fiji group, about 1860. There were only a few survivors.

HAUDAUDINE (2390), French ship, with 3000 tons of nickel ore from Kone (New Caledonia) to Glasgow, was totally wrecked on a reef between Cape Goulvain and Contrarieté Island, New Caledonia, during the night of 3 January 1905, a few hours after the tug had left her. Her crew arrived safely in Sydney.

HAURAKI, s.s., stranded near Otumutua Point, New Zealand, 7 November 1886, having been navigated too close along shore. She foundered off Cape Farewell, 28 February 1887, having sprung a leak.

HAVEA (8), ketch, of Sydney, was wrecked at Malekula, New Hebrides, July 1914.

HAVERSHAM GRANGE (7557), s.s., Houlder Line, was abandoned on fire 800 miles from Cape Town while on a voyage from New York to Australia, 23 October 1906. No lives were lost.

HAWEA (462), s.s., of Dunedin, was wrecked at New Plymouth, June 1888.

HAWEA (1114), s.s. of Dunedin, was wrecked at Greymouth, October 1908. When she was leaving for Adelaide, a heavy roll on the bar caused her to touch bottom and swing on to the rocks. No lives were lost.

HAWEIS, brig, was wrecked on a passage to New Zealand, December 1829.

HELEN (165), brigantine, foundered off East Cape, New Zealand, April 1876.

HELENA (319), barque, was wrecked at Waitakare Bay, between Manukau and Kaipara, New Zealand, September 1853.

HELENA (149), schooner, of Melbourne, was wrecked at Cape Farewell, New Zealand, July 1885.

HELEN B. STERLING (1608), American 4-masted schooner, was dismasted and sinking in heavy weather during the night of 20 January 1922, in the Tasman Sea. All the crew were rescued by H.M.A.S. *Melbourne* (Captain Feakes), whose cutter, under personal command of Commander Ward Hunt saved the 22 hands in a heavy sea at 3 a.m.

HELENS, barque, on a voyage from Bangkok to Melbourne, struck a rock in the Java Sea in 1876.

HELEN WHITE, barque, is supposed to have foundered at sea with all hands. Inquiry was held at Adelaide, 12 September 1882.

HELGA (1254), brigantine, of Sydney, was wrecked off Honolulu, August 1910.

HENRY (101), barque, of Sydney, was wrecked on a reef in mid-Pacific, near 22° S., 151° W., in 1872.

HENRY JAMES (964), ship, of Glasgow, from Newcastle to San Francisco, was wrecked on a reef about 5° N., near Palmyra Island, 19 April 1888. Five men in a boat reached Samoa, the remainder landed on Palmyra Island and were rescued by s.s. *Mariposa*.

HENRY MILLER, barque, struck on Henry Miller Reef to westward of Bellona Reefs, Coral Sea, and foundered December 1868.

HERALD, was wrecked at Hokianga, New Zealand, 4 May 1828.

HERCULES (139), brigantine, of Sydney, was wrecked in Kaipara, New Zealand, March 1874.

HERMES, South Sea whaler, was wrecked with the *Pearl* on the Pearl and Hermes Reef near 28° N., 176° W., prior to 1840.

HERO (29), cutter, was wrecked on Banks Peninsula, New Zealand, October 1880.

HERON (124), schooner, of Maryborough, engaged in labour trade, was wrecked in the South Sea islands, December 1884.

HESTER (840), Sydney to Batavia. When in company with the *Doelwyck*, both ships struck at night on Kenn Reef in the Coral Sea, 21 April 1854. Nine of the *Hester's* crew were picked up by the *Jenny Lind*. See *Doelwyck*.

HETTIE E. TAPLEY (907), schooner, of Sydney, was wrecked at Hong Kong, October 1889.

HEVERSHAM (465), barque, of Wellington, was wrecked in Cook Strait, June 1876.

HIBERNIA (431), from Ireland for Australia, was burnt at sea, January 1833.

HILO (644), U.S.A., barque, left Newcastle for Honolulu, January 1894, and was lost near her destination.

HINDOO (310), ship, from Swan River, Western Australia, to London, was destroyed by fire, 29 December 1847. The crew were saved.

HIPPALOS (299), barque, of Sydney, foundered in Cook Strait, November 1909.

HOLT HILL (2366), 4-masted barque, was wrecked on St. Paul Island, South Indian Ocean, on the night of 13 November 1889. All but one of the crew were saved by climbing up cliffs 200 feet high, and were rescued 8 days later by the barque *Coorong*, of Adelaide.

HOWARD D. TROOP, ship, drove ashore while loading guano from Canton Island, Phoenix group, mid-Pacific, 6 January 1885. Her anchors had dragged in a westerly gale.

HUNTER, Sydney schooner, was wrecked at Entry Bay Island, Cook Strait, June 1829. All hands were saved.

HYDASPES, ship, from London to Melbourne with cargo and passengers, sank in collision with s.s. *Centurion* off Dungeness, England, when in tow of a tug, 17 July 1880.

HYDERABAD, was wrecked near Otaki Beach, Cook Strait, in 1878.

HYDRA (585), barque, of Melbourne, was abandoned off the Solanders, New Zealand, July 1872.

HYGEIA (56), schooner, of Brisbane, was wrecked off New Guinea, March 1894.

IDA, was wrecked in the South Sea islands. Inquiry was held at Sydney, June 1877.

ILLIE (700), American barque, left Newcastle with coal, 15 March 1883, and was wrecked on Gnadalcanal Island, Solomons. H.M.S. *Lark* took her crew to Brisbane.

INCA (1014), wooden 5-masted schooner, after being dismantled and lying in Sydney for several years, was bought in July 1926 to be burnt and sunk for picture film episode.

INCA (959), Peruvian barque, became missing on a voyage from Callao to Sydney in 1911. Her name board was found at Port Stephens in October. She is supposed to have foundered off the coast of New South Wales in July or August 1911.

INDEFATIGABLE, originally the *Calder*, Australian trader-ship. In July 1828, on a voyage from Chile to Sydney with wheat, the Chilian crew mutinied and killed the captain and several others. 5 seamen in a boat landed at Tahiti. The ship reached Guam and was taken by the Spaniards, who hanged the mutineers at Manila in December.

INDIA, barque, from Clyde to Melbourne with 216 emigrants and crew, was destroyed by fire, 19 July 1841, in 16° S., 33° W., through broaching spirits in the cargo with a naked light. 198 people were saved by the French ship *Roland* and landed at Rio de Janeiro; 18 perished.

INDIA (202), barque, was wrecked at Hokianga, New Zealand, November 1883.

INDIAN QUEEN, gold-ship, was wrecked in 1859.

INDRABARAH, stranded on the western coast of New Zealand, near Rangitiki River, 9 May, and was refloated July 6, 1913.

INDUS (364), barque, while on a voyage from Newcastle to Dunedin sprang a leak and foundered when about a hundred miles from the coast of New South Wales, 13 February 1872. No lives were lost, all being saved in boats.

INGER (2459), Norwegian s.s., while loading for Sydney at Ocean Island, Gilbert group, was blown ashore and wrecked, 20 November 1906. No lives were lost.

INVERCAULD (1100), ship, was lost at Auckland Island, south Pacific, 10 May 1864.

INVERENE (912), ship, left Newcastle in 1876 with coal for Java, off which she was wrecked on a reef. One boatload of her crew landed safely 7 days later; another boat with the rest of the crew was never again heard of.

INVERKIP, ship, sank in collision with the *Loch Carron*, 13 August 1904, 22 lives were lost on a dark dirty night off the Fastnet, southern Ireland. She was bound from Melbourne to Queenstown with wheat.

IO, Queensland labour schooner, struck a reef and foundered just outside Great Barrier Reef in 1882.

ISABEL, s.s., Sydney to Marshall Islands, was wrecked at Namu Island, Marshall group, 6 June 1906.

ISABELLA (730), ship, was wrecked on Chesterfield Reefs, west of New Caledonia, July 1875. The crew landed on a coral islet, and some of them went to Queensland in boats, leaving 23 on the reef. These were rescued later.

ISABELLA (256), brig, of Melbourne, was wrecked at Tarawa, Gilbert group, 10 September 1880. She drifted on a reef when the wind failed.

ISABELLA ANDERSON, schooner, was wrecked near Kaipara, New Zealand, August 1904.

ISABELLA RIDLEY (233), barque, of Dunedin, was wrecked at Timaru, New Zealand, April 1877.

ISLAND LILY (123), brig, of Lyttelton, was wrecked at Chatham Islands, east of New Zealand, 3 January 1885, through strong south current and the wind failing.

ISLAY, of Sligo, bound for Sydney, was wrecked near Madura, Java, July 1843.

IVANHOE (164), brigantine, Queensland labour vessel, was wrecked on Malaita in May 1906. The wreck was looted by natives. No lives were lost.

IVANHOE, Chilian barque, was wrecked at Honolulu, January 1916.

JABBERWOCK (140), schooner, of Brisbane, was wrecked in the New Hebrides, May 1884.

JAMES BYRNIE, brig, bêche-de-mer fishery, was captured and looted by natives of Mortlock (Lord Howe) Islands, Solomons, in 1875. Nearly all the crew were murdered. The carpenter was kept till he had repaired all the boats, and was then killed.

JAMES SERVICE (441), barque, of Melbourne, from Calcutta to Melbourne, was wrecked south of Fremantle, 23 July 1878. 24 lives were lost.

JAMES SPEARS, barque, of Sydney, was wrecked on Bampton Reef, Coral Sea, about 1871.

JANE, brig, of Dumbarton, about 1840 called in at the island of Maitea near the Society group, and was at once attacked by natives, who wounded 19 of the crew and destroyed their boat.

JANE (11), lugger, of Sydney, was wrecked off East Cape, Papua, February 1917.

JANE BURRIL (1835), ship of Nova Scotia, was wrecked in 1899 while on voyage from Newcastle to Manila. Crew landed safely on Cebu Island in the Philippines.

JANE DOUGLAS (75), s.s., was wrecked in Cook Strait, January 1912.

JANE SCOTT, was lost in 1849.

JANET, brig, was wrecked at New Caledonia, 1844.

JANET RAMSAY (41), schooner, was wrecked at Waikora River, New Zealand, October 1893.

JANET STEWART (202), brig, Queensland labour vessel from Maryborough, was attacked by natives of Malaita in February 1882. All on board were killed, and the rigging cut to pieces. One boat's crew were absent at the time and escaped. The vessel was looted and set on fire.

JANNA (1495), Norwegian barque, left Sydney, December 1921, for London with wheat and was never heard of again.

JAPAN (332), barque, of Melbourne, was wrecked in 1870.

JEAN BART, large French whaler, was captured by natives in Pohaute or Ocean Bay, Chatham Islands, east of New Zealand, prior to 1840.

JEANETTE (214), brigantine, from Sydney, was wrecked in the Ellice group, 5 December 1924. No lives were lost.

JEERA (57), ketch, from Cooktown to New Guinea, under subsidy from London Missionary Society, was wrecked, November 1904, near Samarai, New Guinea. No lives were lost.

JEMIMA (179), brig, of Sydney, was wrecked on Hammond Rocks, Thursday Island, November 1883.

JENNY LIND, barque, was wrecked on Carn's Midday Reef, now called Wreck Reef, Coral Sea, 21 September 1850. The crew built a cutter out of the wreck.

JENNY LIND (the second). See Section II.

JESSIE (247), brigantine, was wrecked at Long Island, New Caledonia, January 1893.

JESSIE HENDERSON, schooner, was lost on an uncharted reef north of Rabi Island, Fiji group, 14 July 1877. Inquiry was held at Levuka, Fiji.

JESSIE NICCOL (93), schooner, of Wellington, was wrecked at Macquarie Island, South Pacific, December 1910.

JESSIE OSBORNE. See *Okta*.

JESSIE RILEY (17), ketch, of Sydney, was wrecked off north-eastern Papua, March 1911.

JEWESS, American barque, left Newcastle for Manila with coal about 1871, and was never again heard of.

JOHN A. CAMPBELL, 4-masted schooner, of Sydney. Brisbane to Gilberts, while loading copra at Tarawa in 1922 took fire and was completely destroyed. No lives were lost.

JOHN BULL, ship, Sydney to Timor, was lost in the Straits of Lombok, in 1840.

JOHN HUNT, schooner, stranded on Wakazu Reef, Fiji Islands, 26 August 1882.

JOHN HUNT, schooner, was wrecked on Vanua Levu, Fiji, through missing stays, 9 February 1885.

JOHN MURRAY (1144), ship, of Melbourne, was wrecked at Malden Island, mid-Pacific, July 1918. She was a Victorian government sea-going training ship, formerly the *Loch Ryan*. No lives were lost.

JOHN O' GAUNT (1197), barque, of Liverpool, from Newcastle, New South Wales, was burnt at Tocopilla, Chile, 23 January 1897.

JOHN WILLIAMS, the first, barque, of London Missionary Society, was wrecked on Pukapuka, or Danger Island, north of Samoan group, about 17 May 1864, by a strong westerly current. All were saved.

JOHN WILLIAMS, the second, ship, of London Missionary Society, left Sydney August 1866, and struck hard on a reef in Anelcahaut Harbour, Aneityum Island. She returned to Sydney, left again, and was totally wrecked on Niue (Savage Island), 8 January 1867. All hands were saved. The wreck was sold to 'Bully' Hayes, who brought her people to Samoa in his brig *Rona*.

JOHN WILLIAMS (186), the third, London Missionary Society's barque, formerly the *Samoa*, began service in 1868 and continued until sold in 1894. While trading between New Zealand and Sydney she became missing with all hands in 1896.

[JOHN WILLIAMS (660), the fourth, s.s., still continues in service.]

JOSEPH CRAIG (694), barque, of Auckland, was wrecked at Hokianga Heads, New Zealand, August 1914.

JOSEPHINE WILLIS (786), emigrant ship, from London to Auckland with 70 passengers and 40 crew, sank in collision with s.s. *Mangerton* off Folkestone, 3 June 1856, at night. 69 lives were lost.

JOSHUA BATES (569), ship, of Adelaide, was condemned at the Mauritius in 1872. She was built in 1844 by Donald McKay for transatlantic trade, and was sold to Melbourne in 1862, to Adelaide in 1872, and condemned shortly afterwards.

JOYCE PHILLIPS (514), barque, of Sydney, foundered at sea, February 1880.

JUBILEE (30), schooner, of Sydney, was wrecked in the South Sea islands about 1890.

JUBILEE (105), schooner, of Auckland, became missing with all hands, August 1920.

JULIA, ship, from Melbourne to Calcutta, anchored near Port Phillip Heads and caught fire, 7 September 1853. She was beached near Point Nepean, where the fire was extinguished and she was eventually refloated.

JULIA, schooner, was wrecked at Noumea, 6 September 1894.

JULIA PRICE (41), schooner, of Auckland, was wrecked at Rarotonga, May 1888.

JULIE REITZ (257), schooner, of Newcastle, was lost on an uncharted reef, about 5° S., 123½° E., off the coast of Java, September 1877. Inquiry was held at Surabaya, 3 October 1877.

KAIPARA, s.s., stranded in Rangitoto Channel, New Zealand, January 1910.

KAIRAKI (462), s.s., is supposed to have been wrecked off Point Elizabeth, New Zealand, in a heavy gale, September 1914. All hands (16) were lost.

KAKANUI (57), s.s., of Dunedin, disappeared while on a voyage from Macquarie Island, South Pacific, January 1891.

KANGAROO (185), s.s., foundered off Cape Campbell, New Zealand, 2 May 1884. She was navigated too close along shore.

KAPUNDA (1095), ship, from London for Australia with migrants, is supposed to have sunk after collision with barque *Ada Melmore* off Brazilian coast on 20 January 1886. 298 lives were lost.

KARU (267), s.s., formerly *Holmdale* and *Targanten*, from Whangape for Sydney, was abandoned leaking off Cape Maria Van Diemen, 28 February 1926. 10 men landed safely, 2 were drowned in the surf. She drifted ashore and was wrecked.

KATE, barque, in Sydney-Auckland trade, sank in collision with an unknown vessel, 6 December 1869.

KATE WALTERS (580), barque, of Sydney, was scuttled off the China coast, October 1878.

KAWATIN, s.s., stranded on Rangitoto Island, near Auckland, 7 December 1886, through lack of ordinary precautions in thick weather.

KEDAR (532), barque, of Melbourne, was abandoned near Tonga, South Sea islands, June 1878.

KEEWATIN (775), barque, was abandoned in 11° S., 112° E., being on fire, 6 January 1887, through spontaneous combustion of coal cargo. Inquiry was held at Surabaya.

KENNEDY, s.s., stranded on North Beach, Grey River, New Zealand, July 1880, through the signalman at the semaphore giving a wrong signal.

KENTISH LASS (306), barque, of Wellington, became missing in 1890.

KHYBER, barque, left Port Phillip for Queenstown with wheat, and in violent weather drove ashore on the Cornish coast, 15 March 1905, and became a total wreck. 3 persons were saved, 23 drowned.

KIAORA (84), s.s., of Sydney, was wrecked in the Gulf of Papua, May 1914.

KILBURN (3271), s.s., of London, from Newcastle, New South Wales, to Guaymas, was wrecked on Ethel Reef, near Yasawa group, Fiji Islands, 20 May 1910. The crew were rescued by the A.U.S.N. Co.'s s.s. *Amra*. No lives were lost.

KINCLUNE (741), barque, from Sydney, stranded near Kaipara Heads, New Zealand, at night during a west gale, 16 November 1904. The crew landed safely but with difficulty.

KIWI (133), s.s., was wrecked at Kahau Island, New Zealand, April 1894.

KNIGHT OF ST. GEORGE (4710), s.s., was wrecked at Tonga, 30 August 1911. No lives were lost.

KNOWSLEY HALL (1773), ship, London to New Zealand with passengers and general cargo, became missing in 1880, and is supposed to have foundered with all hands.

KONINI (2300), s.s., was wrecked at the entrance to the Bluff, New Zealand, December 1924, while on her maiden voyage from Adelaide. No lives were lost.

KORANUI (301), s.s., was wrecked at Blind Bay, New Zealand, September 1889.

KOSCIUSKO (1192), Aberdeen White Star wooden clipper ship, was sold to Cowlishaw Brothers of Sydney and broken up at Canton in 1899.

KOTUKU (662), s.s., was wrecked at Greymouth, New Zealand, May 1912.

KUMBARA (53), schooner, with auxiliary engine, was burnt in the Solomons, February 1913.

LADYBIRD, favourite Australia-New Zealand passenger s.s., 1860-80. Became for many years a hulk at Wellington. She was condemned, May 1905, and used as a target for gunfire in Cook Strait, June 1905.

LADY BLACKWOOD, was wrecked on Antediluvian Island, near Dampier Straits, in 1840.

LADY DARLING (250), schooner, of Melbourne, was wrecked at Riverton, New Zealand, May 1871.

LADY DARLING (109), labour schooner, of Brisbane, was wrecked near Port Sandwich, Malekula Island, New Hebrides, March 1881. No lives were lost.

LADY EMMA, barque, stranded on a reef off Southport, Chalky Inlet, New Zealand, 28 August 1879.

LADY FRANKLIN (235), barque, of Melbourne, was wrecked at Kaipara, New Zealand, July 1876.

LADY FRANKLIN, government brig, was seized by 22 convicts, December 1853, while on a voyage from Hobart to Norfolk Island. After retaining possession of her for several days they provisioned the boats and left her.

LADY HOWDEN, brig, sandalwood trader, was wrecked, June 1850, on Onega Reef, near Lakemba,

Fiji, where the crew landed safely and were afterwards taken off by H.M.S. *Bramble*.

LADY LAWRENCE (1384), ship, of Liverpool, left Newcastle, July 1895, for Valparaiso and was not heard of again. 25 lives were lost.

LADY MONTAGUE, ship, of London, left China with 500 Chinese emigrants and crew for Callao in 1849. She called in at Hobart and sighted New Zealand. The voyage took 4 months, during which time nearly 300 perished through sickness, disease, and harsh treatment.

LADY MUNRO, was wrecked on a passage from Calcutta to Sydney, 11 October 1833. 76 were drowned.

LADY RAFFLES, ship, of London, was burnt at Sydney, April 1842, while loading. She was scuttled, but raised again in May.

LAEISZ (4500), German-Australian s.s., on voyage from Sydney to Hamburg, struck a rock in the Red Sea and sank, 20 March 1908. All the crew arrived safely at Aden.

L'AIGLE, French ship, was wrecked near the island of Tao, Tonga, about 1845.

L'AIMABLE JOSEPHINE, French brig, sandalwood trader, was captured by natives of Somo-Somo, Fiji, and most of the crew massacred, in 1834.

LALLA ROOKH, schooner, was attacked and looted, 29 July 1885, by natives of Hoop Iron Bay, Moresby Island, SE. New Guinea, who killed all the crew. She was afterwards recaptured and brought to Townsville.

LANCASHIRE LASS, cutter, of Auckland, was wrecked at Samoa in 1889.

LANCASTER, ship, struck on Lancaster or Nielson Reef, near 27° S., 146° W. in 1831.

LANOMA, Walker's clipper barque, on a voyage from Australia to London was wrecked on Chesil Beach, near Portland Bill, March 1888, the captain and 11 hands being lost. They had thick weather at the time, and struck at midnight.

LAPWING (232), brigantine, of Auckland, was condemned at Monte Video, October 1886.

LARGO LAW (1587), well-known Australian trader ship, was burnt in Independencia Bay, Peru, February 1905, with no lives lost.

LA SEINE, French 20-gun frigate, was wrecked, 4 July 1846, on a reef near Balade, New Caledonia. All hands, nearly 200, were saved.

LASTINGHAM, ship, was wrecked near Cape Jackson, New Zealand, 1 September 1884. 18 lives were lost. She drifted into a bay instead of running boldly up Cook Strait.

LAUDERDALE (1071), s.s., was wrecked at Greymouth, New Zealand, in 1910.

LAUGHING WATER (411), brig, of Sydney, was wrecked at Invercargill, New Zealand, January 1870.

LAUNCESTON, barque, under the scoundrel 'Bully' Hayes, left Newcastle with coal for Bombay, put into Sydney, and left, April 1861. She arrived in August, at Surabaya, where Hayes discharged the coal and then probably made off with the vessel.

LAURA, Peruvian barque, foundered with all hands off New South Wales, July 1911, on voyage from Callao to Sydney. Wreckage was found on Cronulla Beach.

LAUREL, inter-island schooner, was wrecked at Beru, Gilbert Islands, about July 1908.

LAVINA, schooner, of Sydney, was looted and burnt at Port Praslyn, New Ireland, 16 July 1873. Natives killed 6 of the crew; the master and 3 men escaped.

LAVINA, schooner, was wrecked at Port Stephens, September 1869.

LAVINIA, Queensland labour vessel, had a number of her crew killed in 1883 by natives of Yemyu Cove, Epi Island, New Hebrides, who on three previous occasions had performed similar outrages.

LAYARD (175), brig, of Melbourne, was wrecked at Timaru, New Zealand, June 1870.

LEGION OF HONOUR (1219), wooden clipper ship, built in 1863 for White Star Line, was sold about 1874 and wrecked off Tripoli coast in 1876.

LEILA M. LONG, American barque, left Newcastle for Manila with coal about 1871, and was never again heard of.

LEITRIM (9540), Federal S.N. Co., was very extensively damaged by fire in the Suez Canal, 7 January 1924, while bound from Australia to England.

LEMKENHAFN (2057), 4-masted barque, capsized at Calcutta, but her masts and yards fell across a s.s., which supported her. She went to Newcastle, New South Wales, and loaded coal for the western coast of South America, but after discharging this cargo she capsized and sank off Cerro Azul, Peru, 4 July 1924.

LENTON (23), yawl, of Sydney, was wrecked on coast of New Guinea, June 1888.

LEONORA, brig, the notorious 'Bully' Hayes master, formerly American brig *Waterlily*, was wrecked in South Harbour, Strong's Island or Kusaie, Caroline group, 15 March 1874. No lives were lost. Louis Becke was her supercargo.

LEOTA (778), barque, of Melbourne, was wrecked at Rotumah Island, March 1878.

LESLIE (108), Queensland labour schooner, was wrecked on Aneityum Island, New Hebrides, 26 April 1882.

LEUENEUWA (62), ketch, of Sydney, was wrecked in the Solomons, February 1911.

LILY (45), schooner, of Auckland, was wrecked at Apia, Samoa, March 1889.

LISMORE (1676), ship, from Melbourne to Coronel, was wrecked on the coast of Chile, May 1906. 4 persons were saved, 22 drowned.

LIZZIE (223), brigantine, trading from Australia to the Solomons, was dismasted in a hurricane during a voyage from Sydney, November 1888, and was condemned as unseaworthy.

LIZZIE AND ROSA (380), barque, of Sydney, was wrecked at Hong Kong in 1874.

LIZZIE BELL (1036), barque, of Liverpool, was wrecked off New Zealand, 25 July 1901. 12 lives were lost.

LIZZIE GREY (85), schooner, of Lyttelton, was wrecked at White Rock Station, New Zealand, November 1888.

LIZZIE IREDALE, ship, left Newcastle with coal for San Francisco, 5 March 1887, and was never heard of again.

LIZZIE TAYLOR (77), ketch, was wrecked in the Friendly Islands, October 1915.

LOBO (860), barque, of Adelaide, was wrecked off East Africa, October 1916.

LOCH DEE (700), barque, from Lyttelton for Falmouth with wheat and wool, sailed, 3 March 1883, and was not heard of again. 17 lives were lost.

LOCH EARN (1200), iron clipper ship, was built in 1870 and continued in the Australian trade till 1873, when she collided with and sank the French transatlantic mail s.s. *Ville du Havre*, only 26 lives being saved, while 226 were drowned. Two days later the *Loch Earn* sank, all aboard being saved by a passing ship.

LOCH FYNE (1213), iron clipper ship, built in 1876, sailed from Australia to load at Lyttelton for Falmouth. She left Lyttelton, 14 May 1883, with wheat, homeward bound, and was not again heard of. Her crew numbered 30, and she had a few passengers.

LOCH LOMOND (1200), iron clipper ship, was built in 1870 and continued in the Australian trade till 1908, when she was sold to the Union S.S. Co. She loaded at Newcastle for Lyttelton, left, July 1908, and was not heard of again. 17 lives were lost.

LOCH LONG (1203), iron clipper ship, built in 1876, left Melbourne, 29 April 1903, for New Caledonia and never arrived. Portions of her wreckage were found on Chatham Islands, east of New Zealand.

LOCH MAREE (1581), iron clipper ship, was built in 1873 and remained in the Australian trade till 1881, when she left Geelong, 29 October, homeward bound. She was spoken next day, but has not since been heard of.

LOCHNAGAR (460), barque, favourite Shaw Savill passenger vessel, stranded on the beach at Poverty Bay, New Zealand, 27 October 1880, where she remained several weeks before refloating.

LOCH NAW (277), barque, was wrecked off New Caledonia, January 1891.

LOCH NESS (1190), iron clipper ship, built in 1870, and in Australian trade until 1908, was sold in Adelaide to be used as a coal hulk, together with *Loch Tay*. In August 1926 *Loch Ness* was towed out to sea and sunk by gun-fire.

LOCH RYAN (1144), iron clipper ship, was sold to the Victorian government, who changed her name to *John Murray* and used her as a sea-going training-ship. She was wrecked at Malden Island, July 1918.

LOCH SHIEL (1218), iron clipper ship, built in 1877, was lost off Milford Haven, 30 January 1901, when outward bound from Glasgow to Adelaide. There was no loss of life, part of the crew being rescued by lifeboat and part scrambling ashore from the end of the bowsprit.

LOCH SUNART (1231), iron clipper ship, built in 1878, was wrecked on her second voyage out to Melbourne on the Skulmartin Rock, near Glasgow, January 1879.

LOCH TAY (1911), similar to *Loch Ness*, except the sinking.

LONDON, iron screw s.s., foundered in the Bay of Biscay, 11 January 1866, 2 days after leaving Plymouth when outward bound to Melbourne. Only one boat was successfully launched, saving 19 lives out of 250 aboard.

LOOKER IN, Sydney to New Zealand, was wrecked, September 1842.

LOONGANA (279), barque, of Sydney, was wrecked in the Gilbert Islands, January 1912.

LORD GEORGE BENTINCK, ship, foundered, 22 November 1856.

LORD OF THE ISLES (200), schooner, of Sydney, was wrecked at Kaipara Heads, New Zealand, October 1900.

LORD TEMPLEMORE. See *Alsternixe*.

LORD WILLIAM BENTINCK, Sydney to England, was lost at Bombay, with many lives, July 1840.

LORD WORSLEY (500), s.s., employed in Melbourne to New Zealand trade, was lost off Taranaki, 31 August 1862.

LORENZO, barque, drove ashore in a west gale, 6 January 1885, while loading guano at Sydney Island, Phoenix group. Her cables parted.

LOUIE (92), schooner, of Sydney, was wrecked on the New Zealand coast, June 1892.

LOUISE J. KENNEDY (215), schooner, of Sydney, was wrecked at Tarawa, Gilbert Islands, March 1908. She was careened to repair her hull, went right over, and sank.

LUBRA (279), s.s., of Sydney, was wrecked in Jurien Bay, New Zealand, January 1898.

LUCY (66), schooner, of Sydney, was wrecked on Indispensable Reef, south-east of the Solomons, November 1874.

LUCY AND ADELAIDE (90), labour schooner from Maryborough, was wrecked in Havannah Harbour, New Hebrides, during a hurricane, 23 January 1880. She was refloated later.

LUCY ANNE, cutter, of Sydney, sandalwood trader, was captured by natives of Maré, Loyalty Islands, August 1851, and all her crew killed.

LYMAN D. FOSTER (783), brigantine, of Auckland, became missing, January 1920. All hands were lost.

LYTTELTON, ship, was wrecked in Timaru Harbour,

LYTTELTON (1111), ship, was wrecked in Timaru Harbour, New Zealand, 12 June 1886, through want of skill on the part of the tug master, who cast her adrift after taking her half a mile out of her course, when proceeding to sea.

LYTTELTON (104), s.s., was wrecked in French Pass, Cook Strait, 30 September 1886, through striking a sunken rock.

LYTTONA, Queensland labour vessel, was wrecked at Hada Bay, San Christoval, Solomons. All hands reached Brisbane safely, December 1875.

MADAGASCAR (about 1200), Green's Blackwall Line, frigate-built ship, left Melbourne for London, August 1853, with full complement of passengers and 70,000 ounces of gold, and was never afterwards heard of. Weird stories have been circulated of mutiny, and burning of the ship, but they lack confirmation.

MADELINE, from London to Sydney, was wrecked about 1834. All the crew were saved.

MADELINE (114), schooner, of Maryborough, was wrecked at Tongoa, New Hebrides, 16 April 1888, during a hurricane. No lives were lost.

MAELGWYN (1276), barque, on voyage from Peru to Sydney, was abandoned dismasted and sinking off Middleton Reef, Tasman Sea, 26 January 1907. The crew were landed safely on Lord Howe Island. She was abandoned justifiably.

MAGNET, Queensland labour vessel, was wrecked on Tanna Island, New Hebrides, 17 May 1882, by drifting ashore during a calm.

MAHAICA, was wrecked on Wreck Reef in 1854. Survivors reached Queensland after severe hardships.

MAHURANGI (21), cutter, was wrecked on Great Barrier Island, New Zealand, January 1892.

MAID OF JUDAH (756), Aberdeen White Star clipper ship, sold to Cowlishaw Brothers of Sydney in 1870, left Sydney for Shanghai with coal, and was condemned and broken up at Amoy, June 1880.

MAILE (252), schooner, of Auckland, became missing, February 1893.

MAITAI (163), s.s., was wrecked at Mercury Island, New Zealand, June 1889.

MAITAI (3393), s.s., formerly the Canadian-Australian liner *Miowera*, was wrecked at Rarotonga on voyage from San Francisco to Wellington, December 1916. While lying at anchor in heavy squall she was blown on to the reef.

MALEKULA (105), schooner, was wrecked on Bampton Reef, Coral Sea, January 1910, while bound from the Solomons to Sydney. Her cargo of copra took fire and she was beached on the reef. No lives were lost.

MAMBARE (769), s.s., was wrecked at Tutuba Island, South Santo, New Hebrides, July 1902, just before daylight. No lives were lost.

MANA (22), cutter, sank at Waiheke, New Zealand, August 1912.

MANGAPAPA (87), s.s., was wrecked on Karamea Bar, New Zealand, October 1914.

MANHEGAN (1143), barque, of Sydney, was wrecked on the western coast of The Cape Colony, August 1887.

MANUKAU (45), s.s., was wrecked at Waitara, New Zealand, September 1912.

MANU-MANU, cutter, was lost off Fly River, New Guinea, swamped by a tidal wave, September 1886.

MANUNUI (358), barque, of Sydney, was wrecked at Surprise Island, D'Entrecasteaux Reefs, New Caledonia, May 1916. No lives were lost.

MAORI KING (3807), s.s., from Australia, was wrecked on Ningpo Island, China, 15 September 1909, during a typhoon.

MARAMA (211), barque, of Sydney, was broken up at Tahiti, December 1881.

MARELLA (7475), s.s., from Sydney to Singapore, was badly damaged by collision with s.s. *Conus* in Singapore Roads, 24 October 1925. She was towed into shallow water to prevent sinking, was there patched up, and then towed into dry dock for extensive repairs.

MARIA YSASI (381), barque, of Melbourne, was wrecked at Marinduque, Philippines, July 1876.

MARION, cutter, was attacked in Millport Harbour, SE. New Guinea, February 1885, by natives, who killed the 5 people aboard.

MARION RENNIE, Queensland labour vessel, when at Anouda (Cherry Island), north of New Hebrides, was attacked by natives, who killed all the white crew, 22 December 1870, but a few natives among the crew sailed her back to Fiji.

MARLBOROUGH (1124), ship, Shaw Savill Co., left Lyttelton for London, via Cape Horn, 11 January 1890, with 29 crew and one passenger. She was seen two days later, but since then has never been heard of.

MARTHA, brig, sandalwood trader, of Sydney. In 1841, at Mare Island, Loyalty group, her boat was destroyed, and its crew killed by natives, who then devoured them.

MARY, barque, of Sydney, was wrecked near Laughlan Islands, SE. New Guinea, in a very heavy gale, 1 December 1840. 6 were drowned, 4 killed by natives; 15 survivors reached Woodlark Island, where 14 were killed by natives.

MARY A. ANNISON (297), barque, was wrecked at Kaipara, New Zealand, February 1885.

MARY CATHERINE, ship, was wrecked on Middleton Reef, Tasman Sea, in 1851.

MARY HAMILTON, ship, was wrecked on a rock south of Nepean Island, Norfolk Island, prior to 1880.

MARY LAWSON, barque, from Brisbane to China, was wrecked on Middleton Reef, Tasman Sea, June 1866. The captain, his wife, and all the crew were lost, except three who sailed in a boat to Clarence River, where one was drowned in the surf.

MARY MILDRED (460), barque, of Sydney, was wrecked at Kaipara, New Zealand, January 1883.

MARY OGILVIE (68), schooner, foundered at Norfolk Island, June 1893.

MARY STEWART (65), labour brigantine, of Rockhampton, struck and was wrecked on Mary Stewart Reef, off the western side of Paama Island, New Hebrides, June 1874.

MASTIFF (1036), one of Donald Mackay's clipper ships, was burnt in the Pacific, 13 September 1859.

MATAKANA (17), cutter, was wrecked near Nelson in 1911.

MATATUA (6518), Shaw Savill s.s., outward bound to New Zealand, sank after collision with an American s.s. in the Thames, near Gravesend, 24 March 1924. 8 men lost their lives. She was refloated later.

MATAU (147), s.s., of Wellington, was wrecked near Westport, New Zealand, September 1876.

MATHIEU (367), barque, of Newcastle, was wrecked at Kaipara Heads, 26 March 1885. She stood too close in before going about in baffling winds.

MATOAKA (1092), ship, Shaw Savill Co., left Lyttelton for London, May 1869, and was not heard of again.

MATUNGA. See Section IV.

MAY, schooner, was wrecked on the New Zealand coast, 17 October 1902.

MAYFLOWER (53), island ketch, built at Brisbane Water, was wrecked on the eastern coast of New Ireland in a heavy gale, 9 June 1906. No lives were lost.

MAY QUEEN, Queensland labour vessel, had her boat's crew of 9 men killed by natives of Aoba, New Hebrides, in 1881.

MAWHERE, s.s., was wrecked at Greymouth, New Zealand, through bad seamanship when crossing the bar, 29 October 1886.

MAZEPPA (111), schooner, of Auckland, was wrecked in the Caroline Islands, 1886.

MEDA (99), schooner, of Sydney, was wrecked off New Guinea, June 1897.

MEDORA, ship, Sydney to London, was totally lost off Bahia, Brazil, 25 September 1837.

MEGAERA, government ship, with 400 people aboard for Australia. Her bottom was so corroded that she

was beached in a sinking condition on St. Paul Island, South Indian Ocean, June 1871. All hands were saved, and lived ashore till rescued in September by the whaler *Malacca* during very stormy weather.

MEG MERRILIES (143), brigantine, of Auckland, South Sea islands trader, was stranded at Suva, Fiji, July 1881. She was afterwards refloated (see Section II.).

MELROSE, was lost when seventeen days out from Sydney, on voyage to Guam, 10 November 1840.

MELROSE (287), barque, of Sydney, was wrecked at Timaru, New Zealand, September 1878.

MENAI (1296), ship, of Liverpool, left Newcastle, February 1895, for Tocopilla, Chile, and was not heard of again. 22 lives were lost.

MERA (237), schooner, of Dunedin, was wrecked at Hokianga, New Zealand, July 1877.

MERCURY, barque, left Calcutta, October 1833, with passengers and stock for an Anglo-Indian settlement in Western Australia, and was lost with all hands.

MERIDIAN, ship, was wrecked on Amsterdam Island, South Indian Ocean, June 1853. 105 passengers and crew after much suffering were rescued by the American whaler *Monmouth*, which continued to stand on and off the island for 9 days until all were saved.

MERRIE ENGLAND (142), s.s., New Guinea government steam yacht, was wrecked while entering at night through Basilisk Passage, off Port Moresby, October 1912. No lives were lost.

MESNA (5424), Norwegian s.s., was wrecked near Suva, Fiji, 6 September 1924.

MESSENGER (925), barque, was lost on Farewell Spit, New Zealand, 19 September 1879.

METEOR (280), barque, of Sydney, was wrecked in the Solomon Islands, January 1880. She was driven ashore when her cables parted in an unsafe position for anchoring.

MEUETHE, old French warship used as a hulk at Noumea, while being towed to Sydney for breaking up was abandoned and drifted on to Lord Howe Island, where she was wrecked, 9 October 1907. She was subsequently dismantled and burnt. No lives were lost.

MICMAC, brig, sandalwood trader, of Sydney, was destroyed about 1842, by natives of New Caledonia, who killed and ate all the crew.

MIDAS (555), barque, of Dunedin, was wrecked about 1872.

MIDDLESEX, Sydney to London, was wrecked off Brazil, August 1841. The crew were saved.

MIDDLETON, English ship, from Hobart to Singapore, was lost on a reef in Allas Straits, Java, July 1853. The crew then burnt the vessel and arrived safely at Surabaya.

MIGNONETTE, yacht from Southampton for Australia, on 5 July 1884 foundered during a gale, when 1600 miles from Cape Agulhas. 3 men and a boy left her in a lifeboat; 20 days later the boy was killed and eaten. 4 days later the survivors were rescued and taken to England, where 2 of them were sentenced to death for the boy's murder, but were reprieved and imprisoned for 6 months, as the boy was dying when they killed him.

MIKADO (643), hulk, of Dunedin, formerly a tea clipper, was burnt at Suva, Fiji, 20 October 1916.

MIMIHA (54), schooner, foundered off Kaikoura, New Zealand, April 1888.

MINDINI (1302), s.s., stranded on Mellish Reef, Coral Sea, on a voyage from the Solomon Islands to Brisbane, and became a total wreck, 8 March 1923. There was no loss of life.

MINDORO (80), s.s., of Sydney, was wrecked at Dedere, Papua, in 1913.

MINERVA, ship, was lost on Minerva Reef near 23½° S., 179° W., between Fiji and Kermadec groups, in 1831.

MINERVA, barque, of Alloa, Scotland, from Sydney to Manila, on 10 September 1834, struck a coral rock off Luconia Island, Philippines.

MINERVA, schooner, was burnt at sea, 27 March 1849.

MINNA BELL (129), schooner, was wrecked at Lyttelton, January 1893.

MINNIE (17), ketch, was wrecked on Banks Peninsula, July 1890.

MINOTA (26), ketch, of Sydney, was wrecked at Doma, August 1913.

MINNY-DON, British ship, Newcastle to South Island, New Zealand, was never again heard of from about 1878.

MIOWERA, s.s. See *Maitai*.

MIRZAPORE (1186), ship, London to Melbourne with general cargo, stranded on Touquet Point, northern coast of France, 23 October 1883, through the master mistaking Touquet lights for those at South Foreland. His certificate was suspended for 12 months.

MISIMA (195), s.s., of Sydney, was wrecked on a reef at Meunera Island, New Guinea, February 1917.

MOANA (94), schooner, was wrecked at Mokau Head, New Zealand, September 1905. The crew of 7 were drowned. She was to have loaded timber for Sydney.

MONTGOMERYSHIRE (1322), Norwegian ship from Peru for Sydney, was wrecked at Tonga, 12 February 1907. No lives were lost.

MONTMORENCY, Black Ball liner, built in 1854, made voyages to Melbourne and was burnt at Napier, New Zealand, in 1855.

MOONSTONE (2140), s.s., of London, built in 1889, while loading phosphates was wrecked at Ocean Island, near the Gilberts, 27 July 1901.

MORNING STAR (1534), wooden clipper ship, foundered on a passage to England from Samarang in 1879.

MUNIARA (511), s.s., was wrecked on Ebon Island, Marshall group, 15 December 1913. No lives were lost.

MYSTERY (82), brigantine, Queensland labour vessel. On 9 November 1878 natives of Aoba, New Hebrides, killed her boat's crew of 6 men. She became a total wreck on Efate Island, New Hebrides, June 1880.

MYSTERY (14), cutter, of Sydney, was wrecked at Dawson Island, Papua, June 1915.

NAIAD (297), brig, of Sydney, was wrecked on Elizabeth Reef, Tasman Sea, 9 July 1885, through a NW. current.

NANOVA, schooner, foundered during a hurricane while at anchor in Nandi Bay, Fiji, in 1871.

NAPIER, from Melbourne, was lost while loading phosphates at Baker Island, mid-Pacific, April 1871.

NATIVE LASS (106), schooner, of Sydney, foundered in the Solomons, October 1890.

NAUPHANTE (364), barque, of Dunedin, became missing, December 1885.

NAUTILUS (243), barque, of Sydney, was burnt at Noumea, August 1891.

NELLIE (41), cutter, was wrecked at Hotwater Bay, New Zealand, August 1894.

NEPTUNE, ship, was wrecked on Indispensable Reefs, south of the Solomon Islands, when on a voyage from Shanghai to Newcastle, New South Wales, August 1868. The crew were picked up in their boat and landed at Port Denison.

NEPTUNE (343), brigantine, was wrecked at Kaipara, New Zealand, 12 May 1905. She attempted to enter to load timber for Sydney, but a strong SW. gale was blowing and she went ashore and became a total loss. All hands were saved.

NESTOR (457), barque, from Sydney to London via Guam, was wrecked in the English Channel, near Portland, 16 September 1854.

NETHERTON (4226), s.s., Scott Fell Co., had nearly finished loading oil at Aroe Bay, Sumatra, for Australia, when fire broke out and almost destroyed her, 10 January 1909. Her wrecked hull was subsequently towed to Singapore.

NEW ZEALANDER, constant trader to Sydney, was wrecked on the New Zealand coast, 7 August 1836.

NGAHERE (1090), Union S.S. Co., was totally wrecked near Greymouth, New Zealand, while leaving, 12 May 1924.

NIAGARA (292), brig, of Sydney, left Newcastle and is supposed to have foundered off New Caledonia, January 1889. None were saved.

NICOYA (594), clipper ship, built in 1867, sold to a Melbourne firm in 1882, was wrecked at Noumea, January 1894.

NIGHTINGALE (220), brigantine, of Sydney, was wrecked on Nabulici Reef, Ngau Island, Fiji, 29 April 1887.

NIL DESPERANDUM (157), brig, of Melbourne, was wrecked off New Caledonia, February 1876.

NINEVEH (1174), Aberdeen White Star wooden clipper ship, sold to Goodlet and Smith of Sydney, was abandoned and set on fire in the North Pacific, when on a voyage from Puget Sound to Sydney, February 1896.

NINGPO, ship, from Hong Kong to Melbourne, was wrecked on D'Entrecasteaux Reefs, northern New Caledonia, 28 July 1854. A month later 4 men seized the boat and sailed 800 miles to Queensland, where they were nearly killed by natives, but managed to reach Brisbane in September. Survivors were rescued from the sand islets by Lieutenant Chimmo in H.M.S. *Torch*, 26 October 1854.

NIUE (15), lugger, of Sydney, was wrecked off Papua, March 1911.

NIVELLE (2262), English 4-masted barque, from Newcastle, New South Wales, was lost near Antofagasta, on the Chile coast, July 1906.

NODDLEBURN (1053), ship, of Glasgow, left Newcastle, June 1895, for Tocopilla, Chile, and was not heard of again. 25 lives were lost.

NORA CREINA, schooner, was lost in 1859.

NORDEN, barque, was wrecked at the entrance to Suva Harbour, Fiji, in 1901.

NORDWIND (1243), German barque, from Gothen-

burg for Melbourne, was wrecked on the Skerries, 16 December 1906. 3 lives were lost.

NORTHERN BELLE, Queensland labour schooner, was wrecked during a hurricane at Mota Lava, Banks group, March 1899.

NORTHERN MONARCH (1230), barque, left Newcastle for Callao, and was wrecked on the Taranaki coast, New Zealand, during the night, 7 November 1903. No lives were lost.

NORTHERN STAR (327), barque, was wrecked at Kaipara, New Zealand, 18 March 1893.

NORTHFLEET, Blackwall liner, outward bound to Tasmania with a number of emigrants, while at anchor off Dungeness was run into by the Spanish s.s. *Truseillo*, who then steamed away, 22 January 1873. *Northfleet* sank in 30 minutes, and a panic among the emigrants resulted in 293 out of 350 being drowned.

NOTERO (430), barque, was wrecked on rocks extending off Howland Island, mid-Pacific, in 1889.

NOUMEA (142), brigantine, of Sydney, was wrecked on Saumarez Reefs, Coral Sea, May 1880.

NOVARA, ship, was abandoned on fire through spontaneous combustion of coal cargo from Newcastle, New South Wales, 14 March 1882. Inquiry was held at Valparaiso.

NOVELTY, barque, Auckland-Sydney trade, while bound from San Francisco to Auckland, was wrecked on Duke of Clarence Island (Nukunons), north of Samoan Islands, in thick weather, 6 July 1851. Passengers and crew were all saved.

NOVELTY (376), barque, of Sydney, was wrecked at Formosa, December 1877.

OAKBURN (1500), ship, of Greenock, left Newcastle, August 1897, for Antofagasta, Chile, and was wrecked during a fog on Bianca Equador Reef. No lives were lost.

OAKBURN (3865), s.s., from New York to Sydney, was totally wrecked at Duikerpoint, South Africa, 20 May 1906. All hands were saved.

OBERON, barque, from Newcastle to San Francisco, was abandoned on fire in 50° S., 83° W., when 21 days out, through spontaneous combustion of coal, 26 August 1884.

OCEAN (28), schooner, of Auckland, foundered off Fiji, January 1895.

OCEAN CHIEF, wooden clipper ship, was burnt at the Bluff, New Zealand, 23 January 1862. She is supposed to have been set on fire by some of her crew.

OCEANIA (320), barque, of Melbourne, was wrecked in Cook Strait, 4 May 1885. The course had been set too close along land.

OCEAN MAIL, ship, Wellington to London, was wrecked on Chatham Islands, east of New Zealand, 21 March 1877. All were safely landed, as was also most of the cargo of wool, after it had been sold for a song at public auction.

OCEOLA (231), brigantine, was wrecked at Westport, New Zealand, June 1887.

OCTOPUS, dredger, purchased from Natal for Geelong, sank off Tugela River, November 1906, while on voyage to Geelong. 3 lives were lost. Also see *Walrus*.

OHAU (740 gross, 411 net), s.s., of Dunedin, foundered off Port Campbell in a very heavy gale during a voyage from Westport to Lyttelton, May 1889. 23 lives were lost.

OKTA (1058), ship, formerly *Jessie Osborne*, chartered by New Zealand Shipping Co., was sold to Norway about 1878 and renamed *Okta*. In 1913 she left Tasmania for England, put into the Bluff in distress, and was wrecked on Sterling Point, New Zealand.

OLDHAM, whaling vessel, was captured, and all her crew, except the surgeon, were murdered by natives of Wallace (Wallis) Island, between Ellice and Fiji groups, in 1832.

OLEANDER, barque, was abandoned at sea off Western Australia, 1 March 1884. Inquiry was held at Fremantle, 6 March 1884. The master had been imprudent in not returning when he found a leak increasing.

OLIVE BRANCH (32), London Mission schooner, of Melbourne, was wrecked at Samarai, New Guinea, July 1901.

OLIVER LANG (1299), Black Ball emigrant ship, made a few voyages to Australia and New Zealand, and during a heavy gale drifted ashore in Wellington Harbour and was broken up, October 1858.

OLIVIER VAN NOORD, Dutch barque, bound from Melbourne to India, was wrecked on Kenn Reef, Coral Sea, together with the English ship *Rodney*, 7 January 1858. All on board were saved and taken aboard *Sea Park* and *Northumbria*, which were sailing in company with them.

OMAHA (133), brigantine, was wrecked at Waitangi, Chatham Islands, east of New Zealand, 24 July 1887, through her cables parting after she had been run close inshore.

OMAR PASHA (1124), Aberdeen White Star clipper ship, was burnt at sea, April 1869, in 29° N., 43° W., while bound from Brisbane to London with wool. 98 passengers and crew were all saved.

OMEGA (401), barque, of Wellington, was converted into a hulk about 1875.

ONECO, ship, of Liverpool, was abandoned and became a derelict. She was found near St. Paul Island, South Indian Ocean, 2 December 1855.

ONTARIO, brig, of Melbourne, was abandoned in the Indian Ocean, 21° S., 57° E., May 1869.

ONWARD (286), barque, was lost on Bampton Shoal, Coral Sea, 15 September 1878. The master and most of the crew were lost.

OOMA (3391), s.s., of Melbourne, from Australia to Ocean Island, Gilbert group, was wrecked at the latter place, 9 February 1926. No lives were lost.

OPOURI (218), s.s., of Lyttelton, was wrecked at Grey River, New Zealand, September 1917.

OREGON (17), paddle steamer, was wrecked at Mokau, New Zealand, about 1890.

ORETI, of Wellington, stranded in 1876.

ORIENTAL (281), barque, of Melbourne, was wrecked at Malden Island, mid-Pacific, January 1878, while loading cargo of phosphates.

ORION, of Faversham, stranded at Auckland Island, South Pacific, 11 December 1872.

OROWAITI, Union S.S. Co. oil tank s.s., was totally wrecked in a fog, 12 August 1924, off Lower California, while on voyage from Wellington.

ORPHEUS (1700), H.M.S., s.s., was wrecked on Manakau Bar, New Zealand, 7 February 1863, only 70 of the crew being saved, but 190 drowned. It was noon of a fine day, but with a heavy sea running on the bar; deep water was shown on the chart, but the bar had shifted.

ORWELL, owned by Robert Towns of Sydney, was lost in 1848.

ORWELL (168), schooner, of Auckland, was wrecked in the Gilbert Islands, July 1881.

OSPREY, brig, H.M.S., 12 guns, was totally wrecked off the entrance to False Hokianga, New Zealand, through mistaking it for Hokianga, 11 March 1846. No lives lost.

OTAGO (642), s.s., of Melbourne, was wrecked at Chasland's Mistake, Foveaux Strait, New Zealand, 4 December 1876.

OUR HOPE (237), brig, of Melbourne, was wrecked at Oamaru, New Zealand, 18 July 1872, through stress of weather.

OURIMBAH, North Coast S.N. Co. s.s., went ashore on South Africa, November 1909, when outward bound for Sydney on her maiden voyage, and became a total wreck. No lives were lost, but the crew lost all their effects.

OVALAU (116), schooner, of Auckland, was wrecked on the Society Islands, October 1880.

OVALAU (769), s.s., was burnt and sank at Lord Howe Island, 19 October 1903, during a voyage from the Solomons to Sydney. Fire broke out after leaving Norfolk Island. All passengers and crew landed safely at Lord Howe Island.

OWAKE BELL (45), ketch, of Lyttelton, was wrecked on the New Zealand coast, January 1894.

PACIFIC, left Australia in 1860 and was not heard of again.

PACIFIC SLOPE (799), brigantine, of Sydney, foundered off China in 1889.

PACKET, whaling brig, of Sydney, was wrecked on Elizabeth Reef, 24 February 1857, at midnight during a gale, and smashed up next day. The crew sailed away in 2 of her boats, were picked up 4 days later, and landed at Moreton Bay.

PAKEHA (173), brig, of Sydney, was wrecked on Ninety Mile Beach, South Island, New Zealand, June 1881.

PALANQUIN, barque, was wrecked on Nelson Island, Chagos Archipelago, Indian Ocean, 20 December 1844.

PALESTINE, barque, was destroyed by fire at sea, through spontaneous combustion. Inquiry was held at Singapore, 3 April 1883.

PALMYRA, Sydney to India, was wrecked in Java Sea, 7 October 1848. The crew were saved.

PAPANUI (4242), s.s., of Melbourne, was burnt at St. Helena, South Atlantic, September 1911, during voyage from England to Australia. No lives were lost.

PAPAROA (7737), s.s., on a voyage from Liverpool to Australia was abandoned on fire and sinking, 17 March 1926, 250 miles NW. of Cape Town. All lives were saved by the P. & O. s.s. *Barrabool*.

PARISIANA, s.s., was burnt near St. Paul Island, South Indian Ocean, December 1910.

PARNELL (351), brigantine, of Sydney, was wrecked off New Guinea, December 1891.

PARRAMATTA, stranded on Anegada Shoal, Magellan Straits, in 1859.

PARTHENOPE (1563), iron clipper ship, built in 1875, was in the Australian trade for years, then sold to Italy. She left Newcastle, New South Wales, 31

July 1907, with coal for Antofagasta, and was not heard of afterwards.

PATERSON (260), paddle s.s., of Wellington, was wrecked, July 1874.

PATRICIAN (1213), ship, of New York, from Newcastle for Lyttelton, 400 miles E. of Australia foundered in a heavy gale, all hands being safely taken aboard the s.s. *Fifeshire* by skilful and gallant seamanship, 28 August 1896.

PEARL, South Sea whaler, was wrecked together with the *Hermes* on the Pearl and Hermes Reef, near 28° N., 176° W., prior to 1840.

PEARL, H.M.S. auxiliary s.s., Commodore J. G. Goodenough, in command of the Australian station, when leaving the shore in his boat at Carlisle Bay, Santa Cruz Islands, was attacked by natives, who wounded him and 6 of the crew with arrows, 12 August 1875. He and 2 seamen died several days later from tetanus.

PEARL (36), schooner, of Lyttelton, was wrecked at Corsair Bay, Lyttelton, August 1892.

PEERLESS (46), schooner, of Auckland, was wrecked off Suwarrow Island, north-east of Samoa group, August 1876.

PEERLESS (218), brigantine, was wrecked at Noumea, New Caledonia, 19 January 1893.

PELHAM (238), s.s., was wrecked at Bluff Harbour, New Zealand, August 1886.

PELLEGRINA O (1411), Italian ship, left Newcastle, New South Wales, with coal for Antofagasta in 1907, and has not since been heard of.

PELOTAS (251), brigantine, was wrecked at Wanganui River, New Zealand, while towing out bound for Sydney, 10 June 1906. No lives were lost.

PENGUIN (517), s.s., foundered in Cook Strait during dirty weather, February 1909. 67 lives were lost.

PENYARD PARK (377), barque, regular passenger ship from London from 1844, left Newcastle for New Zealand and became missing, May 1854.

PERCENEAN, Sydney, brig, was lost at Campbell Island, south of New Zealand, October 1828. All hands were saved.

PERI, small schooner, received aboard at Levuka, December 1870, 80 natives from the kidnapper *Nukulau*, to be conveyed to Rewa River, Fiji. These, being treated with brutality, murdered the crew, and then drifted starving for 5 weeks, 1800 miles, to the Queensland coast, where the 13 survivors were rescued by H.M.S. *Basilisk*, 5 February 1871, and landed at Cardwell.

PERI (17), ketch, of Sydney, was wrecked at Fly River, Papua, in 1913.

PERTH (1126), s.s., of Melbourne, was wrecked at Greymouth, New Zealand, November 1921.

PERTHSHIRE (5550), s.s., broke her propeller shaft when midway between New South Wales and New Zealand and drifted helplessly in the Tasman Sea for 7 weeks, before being found and towed into Port Jackson, 19 June 1899.

PERUVIAN (304), barque, Sydney for Lima, was wrecked on Bellona Reefs, Coral Sea, in 1846. Of the 21 on board only 7 were saved. See WILD WHITE MEN.

PHARSALIA (3500), s.s., from Newcastle to Manila, near which place she was stranded, March 1905. She was refloated in May.

PIAKO (1075), iron clipper ship, built in 1876 for New Zealand Shipping Co., was sold to Germans, and in 1900 left Melbourne for South Africa and has not been heard of since.

PILBARRA (2664), s.s., from Sydney to Noumea and Suva, left Noumea for Suva, 2 March 1905, and lost the blades of her screw in heavy weather on the 4th. She drifted close in to the south-east point of Erromango, New Hebrides, where she was abandoned at 10 p.m. on the 7th, her people pulling round for Dillon Bay in boats. At daybreak she was seen by them to the SW., having passed them during the night. Two boats pulled after her, and again boarded her at noon on the 8th. S.S. *Induna* arrived at Dillon Bay on the 13th, and went in search of her, picked her up on the 17th off D'Entrecasteaux Reefs, off New Caledonia, and towed her into Vila Harbour on the 21st.

PILOT, South Sea whaler, was attacked in the Nicobar Islands, in 1840, by Malay pirates, who killed most of the crew and looted the vessel.

PIONEER, ship, was wrecked in the Solomon group in 1882. H.M. surveying vessel *Lark* rendered assistance to the crew at Rua Sura Island.

PIRATE (190), schooner, of Auckland, left Newcastle, April 1897, for Gisborne, and was wrecked near Portland, New Zealand. 1 life was lost.

PITCAIRN ISLAND (1359), from Wellington to London, was lost by fire at sea in 52° S., 90° W., in 1906. 2 boats with 21 men reached Chile. No lives were lost.

PLEIONE (1092), ship, stranded near Kapiti Island, New Zealand, 16 March 1888, with one life lost. Kapiti Island was mistaken for Stephen Island.

POHERUA (716), s.s., of Dunedin, was towed to sea and scuttled, February 1924.

POMONA, emigrant ship, was wrecked, 20 April 1859.

PORT ELLIOTT (7395), s.s., Commonwealth and Dominion Line, went ashore in hazy weather off East Cape, New Zealand, 12 January 1924, and became a total loss. No lives were lost. She was voyaging from New York to New Zealand and Australia.

PORTER, from Sydney to Manila, was wrecked at Palawan Island, Philippines, 20 October 1842.

PORT KEMBLA (4700), s.s. See Section IV.

PORT KEMBLA (8465), s.s. of London, from London to New Zealand and Australia, stranded off San Salvador in July 1926 and became a total loss. Cargo is being salved. No lives were lost.

PORT JACKSON, barque, of Sydney, was lost on the China coast, 7 August 1858.

PORT NICHOLSON (8402), s.s., Commonwealth and Dominion Line, was very badly damaged by stranding near Las Palmas, Canary Islands, while bound to Australia, 24 October 1924.

PORT STEPHENS (3554), s.s., Anglo-Australasian Line, from Dunedin to Newcastle in ballast, lost her propeller, September 1916, and drifted to southward for nearly a month, when she was abandoned near Auckland Island, as all her provisions and coal had been used and her stern gland leaked badly. The crew were taken off by the ship *Ravenscourt* and landed in October.

POSTHUMOUS, barque, was wrecked off Kaipara, New Zealand, 21 September 1853, on her way from Melbourne.

PRAIRIE (139), brig, of Hobart, was wrecked at Kaipara, New Zealand, January 1880.

PRIDE OF THE LOGAN, frequently misspelt *Lagoon*, pearling schooner, Queensland to Papua, was looted and burnt in Mudge Bay, Moresby Island, SE. New Guinea, 6 of the Chinese crew killed, April 1887.

PRINCE ALFRED (161), schooner, was burnt at Dunedin about 1882.

PRINCE ARTHUR (296), barque, of Melbourne, was wrecked at Astrolabe, Fiji, August 1883.

PRINCE EDWARD (174), brig, of Melbourne, was abandoned off West Cape, New Zealand, July 1869.

PRINCE JAMES (499), brigantine, left Newcastle, December 1895, for Valparaiso, and was not heard of again. 12 lives were lost.

PRINCE OF DENMARK, schooner, sailed from Sydney and on 19 March 1863 was wrecked on Chesterfield Reefs, Coral Sea. Out of the wreck her crew built a cutter which they called *Hamlet's Ghost* and in which they all reached Brisbane.

PRINCESS (18), cutter, of Sydney, was wrecked in Fiji, December 1892.

PROGRESS (21), ketch, of Sydney, foundered near Nuakata Island, SE. New Guinea, 1914.

PRUTH (4698), s.s., was wrecked on Natara Reef, near Port Moresby, and abandoned, 2 January 1924, while on voyage from New York via China and New Britain to Australia. No lives were lost.

PUELCHE (195), brig, of Auckland, was wrecked in 1873.

PUKA PUKA (23), schooner, of Auckland, was wrecked at Waiheke, New Zealand, in 1917.

QUEEN BEE, of London, was lost on Cape Farewell Spit, New Zealand, 6 August 1877, through improper navigation.

QUEEN CHARLOTTE, sometimes wrongly called *Royal Charlotte*, ship, was wrecked on Frederick Reef, Coral Sea, 26 June 1831.

QUEEN CRISTINA (3596), s.s., of Glasgow, was wrecked on Lihou Reef, Coral Sea, October 1899. No lives were lost.

QUEEN OF THE COLONIES (1346), wooden clipper ship, Black Ball Line, built in 1852, was wrecked off Ushant in 1874, while bound from Java to Falmouth.

QUEEN OF THE SOUTH (121), s.s., of Wellington, was wrecked at Cape Campbell, New Zealand, in 1919.

QUEEN OF THE THAMES, Devitt and Moore's steam clipper ship, was lost on her maiden voyage, while returning from Melbourne to London, in Struys Bay, South Africa, 18 March 1871, just after midnight. 4 were drowned out of 315 people aboard.

QUIRAING (653), s.s., became missing between Newcastle and New Zealand, July 1902. All hands (25) were lost.

RAMSAY, barque, from Brisbane to London with wool, was wrecked on Middleton Reef, Tasman Sea, about 1852. 11 lives were lost and survivors in boats suffered hardships before being picked up.

RANGATIRA (460), s.s., of Sydney, was wrecked on a reef near Noumea, New Caledonia, 1 June 1875, with no lives lost.

RANGATIRA (196), s.s., was wrecked on Peprel's

Reef, near New Plymouth, New Zealand, 7 September 1880.

RANGOON, P. and O. s.s., was wrecked off Point de Galle, Ceylon, 2 November 1871, with no lives lost.

RANSOM (237), brigantine, of Auckland, was wrecked at Pleasant Island or Nauru, near the Gilbert group, October 1885.

RAPID (153), was lost in the South Sea islands on a voyage from Sydney to China via New Zealand, 14 January 1841. The crew were saved.

REBECCA, ship, was wrecked in 1853.

RECONNAISSANCE (208), barque, of Sydney, was wrecked in the South Pacific, October 1884.

RECORDER, ship, was wrecked on Madge Reefs, Thursday Island, February 1891.

RED COAT (152), brigantine, of Sydney, was wrecked in Fiji, February 1883.

RED ROVER, ship, London to Sydney, was lost at Port Praya, off Cape Verde Islands, 24 April 1839.

REINDEER, ship, was wrecked on Pocklington Reef, off SE. New Guinea in 1855. The crew were 42 days in a boat, and then arrived at Port Curtis, Queensland.

RELIANCE, brig, was wrecked in the Solomons in 1868.

RENARD (81), schooner, formerly H.M.S., bound for Brisbane, left Rubiana, Solomons, 20 January 1894, and was not heard of again. She is supposed to have been lost in a hurricane off Bampton or Chesterfield reefs in the Coral Sea.

REPUBLIC (2347), ship, of Liverpool, left Newcastle for San Francisco, January 1896, and was abandoned on fire. No lives were lost.

RICHARD DART, brig, from London to New Zealand with 46 passengers, was wrecked on Prince Edward's Island, South Indian Ocean, 19 June 1849, all on board being lost, except 10, who suffered dreadful privations.

RICHARD PARSONS (1160), U.S.A., wooden barque, from Newcastle for Manila, was wrecked on Mindoro Island, Philippines, during a typhoon, 17 September 1894.

RIFLEMAN (718), ship, of Sydney, was condemned at Saigon in 1879.

RINGDOVE (21), cutter, of Auckland, was wrecked in the New Hebrides about 1891.

RIO GRANDE (200), brig, of Newcastle, was wrecked at Gisborne, New Zealand, May 1884.

RIO LOGE (241), auxiliary brigantine, for many years in labour trade, Queensland to New Hebrides etc., left Kaipara for Dunedin, was seen in Cook Strait, 14 January 1909, but not again. All hands (12) were lost.

RIPPLE (59), Queensland labour s.s., of Sydney, was wrecked in the Solomons, February 1887. She was nearly captured by natives in Bougainville Strait, August 1880, losing 4 killed and 13 wounded before driving them off with a loss of 50 men.

RIPPLE (73), s.s., of Levuka, was wrecked in Levuka Harbour, Fiji, December 1914.

RIVER HUNTER (284), brigantine, of Auckland, was wrecked at Whangane, New Zealand, April 1906.

RIVERSDALE (1453), ship, was wrecked at Tchio, New Caledonia, March 1891.

ROANOKE (3347), U.S.A., wooden 4-masted ship, from New York to Melbourne and Sydney, came into collision with s.s. *Llangibby*, off the coast of Brazil, September 1904. Badly damaged, she put in to Rio de Janeiro for repairs. She was in Sydney in May 1905 and left for Nehoue, New Caledonia, where she was completely lost by fire, 9 August 1905. She was the largest wooden ship ever built in America.

ROBERT TOWNS (260), whaler, was wrecked on Malo Island (formerly St. Bartholomew), New Hebrides, June 1873.

RODENBEK (1602), German ship, left Liverpool for Sydney, January 1906, was spoken 3 weeks later in latitude 13° N., and was not heard of afterwards.

RODNEY, ship, bound from Melbourne to India, was wrecked on Kenn Reef, Coral Sea, together with the Dutch barque *Olivier Van Noord*, 7 January 1858. All were saved and taken aboard two other vessels which were in company with them (*Sea Park* and *Northumbria*).

RONA (150), brig, of Lyttelton, owned by the notorious ruffian 'Bully' Hayes, foundered near Reirson's Island, about 10° S., 160° W., 1 May 1869. All hands were saved and reached Manihiki Island.

ROSABEL (42), schooner, of Sydney, was wrecked in the Banks group, near New Hebrides, November 1918.

ROSE (25), cutter, of Auckland, was wrecked at Great Barrier Island, New Zealand, May 1889.

ROSETTA JOSEPH, ship, was wrecked on Elizabeth Reef, Tasman Sea, 1 December 1850, while on voyage from San Francisco. The crew and passengers, 47 all told, left the wreck in 3 boats and arrived safely at Port Macquarie, New South Wales, 10 December.

ROTUMAH (282), barque, of Sydney, was wrecked at Vaton Island, Fiji group, October 1873.

ROXBURGH CASTLE (1049), frigate-built ship, Green's Blackwall Line, built in 1852, in Melbourne passenger trade, was wrecked on the Goodwin Sands in 1876.

ROYAL ADELAIDE (1320), iron clipper ship, from London to Sydney, drove ashore in a heavy SW. gale and was totally wrecked on Chesil Beach, near Portland, English Channel, 25 November 1872. Of the 35 passengers and 32 crew, all but 6 were saved by breaches buoys. Thousands of people on the beach smashed open hundreds of cases of spirits as they floated ashore, and by midnight were all lying drunk on the beach; some 20 of them were dead next day.

ROYAL CHARTER, full-rigged s.s., passenger ship from Melbourne, was wrecked at Moelfra Bay, Wales, while on a voyage from Melbourne to Liverpool, 26 October 1859. Out of 500 aboard, 459 were lost.

ROYAL CHARLOTTE. See *Queen Charlotte*.

ROYAL EDWARD (799), ship, of Liverpool, was abandoned in the South Atlantic in 40° S., 27° W., 3 July 1886. She sustained damage in heavy weather, water got below, and, her cargo of salt dissolving, she became unmanageable and was justifiably abandoned. The crew were rescued by the Norwegian barque *Beltona*.

ROYAL OAK (1243), ship, from Friedrichstadt to Sydney, was wrecked on North Ronaldshay, Orkney Islands, 15 August 1882. The master was blamed for not using the lead.

ROYAL TAR (598), barque, built at Nambucca River in 1876, struck a rock near Tiritiri Island, near Auckland, and sank, November 1901, with her first mate drowned.

RUBY (44), s.s., was wrecked at Mongawai, New Zealand, March 1893.

RUBY (32), ketch, was wrecked in the Solomon Islands, January 1918.

RYNO (85), brigantine, was wrecked at Flint Island, northward of Low Archipelago, South Pacific, January 1892.

SABINE, American schooner, was lost at Upolu, Samoa, January 1850.

SABINE, barque, was lost on the western coast of Borneo in 1859.

ST. BRYCEDALE (302), barque, of Hobart, was wrecked at Algoa Bay, South Africa, July 1875.

ST. DONATIEN (1259), French barque, from Bordeaux to Adelaide, became missing in 1905.

ST. MUNGO (1955), ship, from Liverpool for Sydney, was abandoned on fire in the South Atlantic, 10 October 1906. All hands landed safely in Brazil.

ST. PAUL, French ship, from Bordeaux to Hong Kong, where she shipped emigrants for Sydney in 1858, was wrecked 30 September 1858, on Rossel Island in the Louisiades, SE. New Guinea. The crew took a boat and 9 of them reached the Queensland coast, and then New Caledonia. Some 350 Chinese passengers were killed from time to time and eaten by the Louisiade natives. In January 1859 one survivor was rescued.

ST. VINCENT (532), English ship, was wrecked in Palliser Bay, Cook Strait, 14 February 1869. She left Wellington and ran into a southerly gale, which drove her ashore. There was only 2 survivors out of 22 hands.

SALAMIS (1079), Aberdeen White Star clipper ship, built in 1873, was in the Australian trade from 1875 to 1895, when she was sold to Norway and wrecked on Malden Island, Pacific Ocean, 20 May 1905. She left Melbourne for Malden Island in February. A strong westerly gale had carried away her moorings. No lives were lost.

SAMOA, brigantine, owned by 'Bully' Hayes, was wrecked on Monahiki, near 10° S., 160° W., April 1869. All were saved.

SAMOA (220), wooden auxiliary 3-masted schooner with oil engine, Burns, Philp and Co. in the island trade, was wrecked at night, 29 April 1925, on a reef near Nassau Island. 2 boats were smashed alongside, but a third boat carried all hands safely ashore, where they remained 2 months before being found and taken to Apia, Samoa.

SAMOAN HURRICANE, in which the U.S.A. warships *Trenton, Vandalia, Nipsic* and the German ships *Adler* and *Eber*, were wrecked in Apia Harbour, 16 March 1889. Altogether 147 lives were lost. H.M.S. *Calliope* escaped safely. See *Calliope*.

SANDFLY, H.M. schooner, from Sydney to Santa Cruz Islands, was attacked, September 1874, off Nitendi Island, by natives, who were repulsed after hard fighting, in which they lost about 30 men. It was probably on account of this affair that Commodore Goodenough was attacked. See *Pearl*.

SANDFLY (76), Queensland labour schooner, was wrecked in the Solomon Islands, December 1892.

SARACEN, Sydney to South America, was lost off the Chile coast, March 1828.

SARA DREYFUS (329), barque, of Sydney, was wrecked on Cook Reef, New Caledonia, May 1880.

SARAGOSSA, 4-masted American barque, Newcastle to San Francisco with 4000 tons of coal, was totally wrecked on Mangaia in the Cook (or Hervey) group, August 1904, with one life lost. The crew were rescued by the barque *Batchelors*.

SARAH, brig, of Sydney, was wrecked in a hurricane, on 11 February 1848, in Wreck Bay, on Lifu Island, Loyalty group. Crew escaped ashore.

SARAH (233), brig, of Melbourne, was wrecked at Cape Brett, New Zealand, May 1876.

SARAH AND ELIZA, whaler, of London, was burnt by natives in the South Seas, 22 May 1843. The crew escaped.

SARAH ANNE, was wrecked on Tematangi, Paumoto, Low Archipelago, about 1857. The crew were killed and eaten by natives.

SARAH CRISP, ship, on voyage from Sydney to Hong Kong in 1849, became water logged and dismasted. Her crew starved for 27 days: 18 men died and 19 were saved when terribly exhausted, by the *Emma Sherratt*.

SARAH MOERS, was wrecked in the Coral Sea off the Queensland coast in 1854.

SAUCY LASS, schooner, stranded on Ngele Levu Reef, Fiji, 11 October 1884. The master was censured for not taking observations.

SAVO, small trading schooner, Australia to the Solomons, was attacked and captured by natives of Malaita, December 1888, 3 whites and 12 natives being killed.

SCHILLER (1196), German barque, for Melbourne, stranded near Dungeness in a heavy gale, November 1906. One life was lost. She was refloated the next week.

SCOTIA, s.s., was wrecked near the Bluff, New Zealand, 2 May 1864, with no lives lost.

SCOTSMAN (231), brig, of Sydney, was wrecked at Oamaru, New Zealand, August 1873.

SEA GULL (122), brigantine, was wrecked at Waikawa, New Zealand, January 1886.

SEA NYMPH (327), barque, of Sydney, was wrecked in New Caledonia, October 1889.

SEA SHELL (219), barque, of Hobart, was wrecked at Pum Island, New Caledonia in 1880.

SEA STAR, barque, of London, was wrecked on an uncharted reef in Dampier Strait, north of New Guinea, 14 June 1877.

SEDWELL JANE (188), brigantine, of Adelaide, was wrecked at Algoa Bay, October 1893. The crew were saved.

SEINE, French ship, was wrecked at New Caledonia about 1854.

SERIOL WYN, barque, from London to Sydney with general cargo, came into collision off Beachy Head, with the brig *Louis*, which foundered with all hands but one, 25 September 1881. The *Louis* was in default, as she was running free and did not keep out of the way of a vessel close-hauled.

SELADON (1066), ship, of Newfoundland, from Newcastle for Panama, was wrecked off Starbuck Island, mid-Pacific, 7 August 1897. 1 life was lost.

SERINGA (428), barque, of Sydney, was wrecked in the China Sea, November 1869.

SERINGAPATAM. See *City of Seringapatam*.

SHAMROCK, s.s., formerly of A.S.N. Co., was lost in the China Sea, 22 March 1860.

SHANNON (1290), ship, built in 1862 for Green's Blackwall Line, made voyages to Melbourne till 1883, when she was bought by Ellis of Sydney. While bound from Newcastle to Wellington she sprang a leak, and was condemned, June 1888.

SIAM (5800), motor s.s., was severely damaged by fire at Copenhagen, 12 August 1924, while loading for Australia.

SIBYL (120), schooner, of Maryborough, was wrecked at Mallicolo, New Hebrides, January 1887.

SILBERHORN (1923), 4-masted iron barque of Liverpool, left Newcastle, New South Wales, with coal for Iquique, June 1907, was spoken during the next month, and then disappeared from human ken. Many months later one of her life-buoys was found on the shores of Pitcairn Island.

SILVER LINING, brig, of Sydney, was wrecked at Kakanui, New Zealand, March 1874.

SIMLA, ship, from London for Australia, was sunk in English Channel off Isle of Wight, by collision with ship *City of Lucknow*, on 25 January 1884. 20 lives were lost.

SIR GEORGE GREY, ship, was wrecked in 1865 on a reef, probably Minerva or Ebrill Reef, near 23° S., 133° W., in Low Archipelago.

SIR HENRY (95), brigantine, of Auckland, was wrecked at East Cape, New Zealand, July 1906. All hands were lost.

SIR ISAAC NEWTON (121), schooner, of Sydney, was wrecked near Noumea, New Caledonia, April 1879.

SIR JAMES CLARK ROSS (13,000), Norwegian s.s., mother ship to five small Norwegian whalers in the Antarctic, after filling up with whale oil, left Kerguelen Island, struck a rock, and sank the same day, December 1924.

SIR THOMAS MUNRO, passenger ship, London to Sydney, was wrecked on Bonavista Island, Cape Verde Islands, 10 December 1834. All her people, 56 in number, landed in a boat. They were sailing too close in to the land on a fine clear night.

SIR WALTER RALEIGH (1492), iron clipper ship, Australian trade, built in 1876, left Sydney with wool for London and was wrecked near Boulogne, 29 January 1889, 5 of her crew being drowned.

SISTERS. See *The Sisters*.

SMILING MORN (244), schooner, of Sydney, was wrecked in the South Sea islands, October 1884.

S. M. STETSON, ship, from Newcastle for South America, sprang a leak and was wrecked on Lord Howe Island in 1877. No lives were lost.

SMYRNA (1305), Aberdeen White Star clipper ship, built in 1876, while outward bound to Sydney was sunk in a fog off the Isle of Wight by collision with s.s. *Moto*, 28 April 1888, the captain and 11 of the crew being drowned.

SOPHIA R. LUHRS (661), barque, of Wellington, was wrecked at Kaipara Heads, New Zealand, in 1888.

SOUTH AUSTRALIAN, s.s., was lost in Molyneaux Bay, New Zealand, April 1867.

SOUTH CAROLINA (27), cutter, foundered at Flat Island, New Zealand, August 1888.

SOUTHERN CROSS, first Melanesian missionary vessel, was wrecked on the northern coast of New Zealand, 23 June 1860, during severe storms. No lives were lost.

SOUTHERN CROSS, second Melanesian missionary vessel, 1863 to 1874, was then sold. See Section II.

SOUTHERN CROSS (124), wooden 3-masted schooner, third Melanesian missionary auxiliary steam yacht, built at Auckland in 1874, leaked badly and was condemned in 1890.

SOUTHERN CROSS (291), fourth Melanesian missionary vessel, auxiliary steam yacht, from 1891 to about 1900, was condemned as being unfitted for the work and was sold. See Section II.

SOUTHMINSTER, ship, was lost near Cape Campbell, New Zealand, December 1878. The loss was attributable to flood tide, the chart stating that there was none hereabouts.

SOVINTO (1615), Russian barque, from Dalhousie, New Brunswick, for Melbourne, was wrecked on Prince Edward Island with the loss of 10 lives, November 1906.

SPARTIAN (213), brig, of Sydney, was wrecked in the China Sea, October 1872.

SPLENDID (358), barque, was wrecked at Kaipara, New Zealand, March 1890.

SPORTING LASS, brig, whaler, of Sydney, was wrecked on reefs off New Caledonia, 4 November 1863. One boat with seven men was lost; the remainder of the crew reached Brisbane.

SQUALL (145), s.s., was wrecked at East Cape, New Zealand, February 1916.

STAG (19), cutter, was wrecked at Waiheke, New Zealand, in 1917.

STANLEY (115), labour schooner, of Maryborough, was wrecked on Indispensable Reef, south of the Solomons, 4 July 1883. The master and crew sailed off in a boat to bring assistance. 100 kanakas and 2 whites subsisted on the reef for two months before they were rescued.

STANLEY, brig, stranded on Red Mercury Island, New Zealand, October 1899.

STAR, brig, from Sydney, sandalwood trader, on 1 November 1842 was destroyed at the Isle of Pines, New Caledonia, by natives who murdered and devoured the crew of 20 men. While the brig was burning, some gunpowder exploded, killing about 30 natives.

STAR OF CANADA, was wrecked at Gisborne, New Zealand, 23 June 1912.

STAR OF INDIA, barque, from Newcastle, New South Wales, was beached and abandoned south of Valparaiso, 14 May 1882. The master was blamed for beaching without sufficient cause.

STAR OF NEW ZEALAND (4417), s.s., was beached in Holyhead Harbour, Wales, after collision in 1912. She was refloated later.

STAR OF PEACE, ketch, a small coastal trader. In 1881 was stranded in Chads Bay, SE. New Guinea, where she was looted and burned by natives who also killed the owner. The murderers were punished by Sir W. MacGregor.

STAR OF TASMANIA (632), Aberdeen White Star ship, was wrecked in 1868 while loading at Oamaru, New Zealand.

STAR OF THE MERSEY, of Melbourne, was abandoned near Mota Ngara Island, Cook Strait, 16 June 1877.

STAR OF THE MERSEY (255), brig, of Dunedin, was wrecked at New Plymouth, New Zealand, May 1886.

STAR OF THE SOUTH, s.s., was wrecked on a reef off Cape Gable, New Zealand, March 1865.

STAR OF THE SOUTH (175), s.s., was wrecked at Greymouth, New Zealand, 22 December 1884, through attempting to enter in disregard of harbour signals.

START (27), cutter, was wrecked at Kennedy Bay, New Zealand, March 1893.

STORM BIRD (129), s.s., of Wellington, was wrecked at Wanganui River, New Zealand, September 1916.

STRANGER (249), barque, of Melbourne, was wrecked at Kandavu Island, Fiji group, October 1876.

STRATHCONA (284), 3-masted schooner, of Nassau, New Guinea, was wrecked on Minerva Island, Low Archipelago, with no lives lost, about 1915.

STRATHMORE, passenger ship, London to Australia, with nearly 400 souls aboard, was wrecked in a fog off the Crozets, South Indian Ocean, 2 July 1875. Only 38 survivors landed, and these were not rescued until January 1876, when the American whaler *Phoenix* took them off. The ship was sailing at usual speed in spite of fog and the known proximity to land.

STRATHNAIRN (698), barque, from London to Adelaide with general cargo, sank in collision with s.s. *Edith Hough*, off Ushant, 13 February 1880. There was loss of life. *Edith Hough* was held to blame.

STRATHSPREY, barque, from Newcastle, New South Wales, was lost on Buie Rocks, Valparaiso, 17 July 1882, through the wind failing and the vessel drifting on to rocks.

STUART RUSSELL, was wrecked on Elizabeth Reef, Tasman Sea, about 1856.

SUEVIC (12,500), White Star s.s., from Australia to London, was wrecked on rocks near Lizard Head in a fog, 17 March 1907. 400 passengers were aboard, but no lives were lost. Later on her forepart was cut away with dynamite and the afterpart towed to Southampton and thence to Belfast, where a new bow was built on to her.

SUPERIOR (205), schooner, of Sydney, was wrecked at Makira Harbour, Solomon Islands, January 1883.

SURPRISE (146), brigantine, of Sydney, was wrecked on Efate Island, New Hebrides, March 1883. The mate was blamed for negligence.

SUSQUEHANNA, American 4-masted ship, well known in Sydney, loaded ore at Nehoue, New Caledonia, and a few days after leaving began to leak badly. She was abandoned, sinking, 19 August 1905, and her crew arrived safely at the Solomon Islands after 5 days in boats.

SUVA (177), s.s., was wrecked at Buller River, New Zealand, July 1888.

SWALLOW (298), schooner, of Newcastle, was wrecked in Tory Channel, New Zealand, June 1879.

SYBIL, schooner, from Queensland to the Solomons, was presumably lost near Bellona and Renell Island, Coral Sea, February 1905. There were no survivors.

SYDNEY (192), barque, was lost off Shortland Island, Solomons. Inquiry was held at Sydney, 7 October 1878.

SYRIA, ship, from Calcutta to Fiji with 494 coolies, was wrecked on Nasilai Reef, Viti Levu, Fiji, 11 May 1884, in a strong SE. wind, with 59 lives lost. Dr. MacGregor, afterwards Sir William MacGregor, administrator of New Guinea, was awarded the Albert medal for bravery in rescuing several lives.

TAIAROA (228), s.s., was wrecked near Kaikoura, New Zealand, 11 April 1886, with 30 lives lost. Insufficient allowance had been made for leeway and there was neglect of using lead.

TAKATEA (805), barque, of Sydney, was wrecked at Vostock Island, South Pacific, December 1879.

TAMAR, of Sydney, struck a reef, probably the Chesterfield Reefs, in the Coral Sea, near 21° S., 161° E., about 1870.

TAMBO (450), s.s., of Sydney, was wrecked at Apamana Island, Gilbert Islands, September 1919, with no lives lost. She was for many years an island trader from Sydney.

TARANAKI, s.s., sank in Tory Channel, Cook Strait, 19 August 1868. She was raised and repaired next year.

TARANAKI (327), s.s., of Dunedin, was wrecked at the Bay of Plenty, New Zealand, November 1878.

TARARUA (563), s.s., of Dunedin, was wrecked on Waipapapa Reef, Otago, New Zealand, 28 April 1881. 130 lives were lost.

TARTAR, s.s., struck, probably on Kingman Reef, near Palmyra Island, in mid-Pacific, June 1874. She was found to be in a lagoon enclosed by a network of coral-reefs.

TASMANIA (3000), P. & O. R.M.S., Bombay to London, with 144 passengers, was wrecked on rocks off Corsica, 17 April 1887, with 35 lives lost. She had been set considerably to leeward of her course.

TASMANIA (1265), s.s., of Melbourne, was wrecked at Table Cape, near Napier, New Zealand, 29 July 1897, with 11 lives lost.

TATHRA (193), s.s., foundered near Ambrym Island, New Hebrides, on a voyage from Sydney to New Hebrides and back, 4 January 1912. 24 persons were drowned. She apparently took in much water, which made her unmanageable, and she fell into the trough of the sea and was swamped.

TAUPO (461), s.s., of Dunedin, was wrecked at Tauranga Harbour, New Zealand, February 1879.

TAVIUNI (43), schooner, of Auckland, was wrecked in Fiji, July 1891.

TAY (1591), ship, from Middlesborough to Melbourne with railway iron, stranded on Hasboro Sands, North Sea, 23 June 1888. No allowance had been made for effects of the tide on her course.

TAYLEUR (1979), emigrant ship, on her first voyage from Liverpool to Melbourne, with 458 passengers and 84 crew, was wrecked in a southerly gale on Lambay Island, off the eastern coast of Ireland and 290 lives were lost, 20 January 1854. A number were saved by being lowered on to the rocks from the bowsprit.

TEMPEST, left Australia in 1860, and was not heard of again.

TERRE NEUVE, French barque, foundered in the Indian Ocean during heavy weather, her crew being taken off in a very gallant manner by a boat from the clipper ship *Aristides*, November 1895.

TESSORE, ship, England to Melbourne, sank in collision with the ship *Consett* when west of the English Channel, 10 October 1877. All were saved.

THEOPHANE (1525), ship, left Newcastle, New South Wales, December 1891, for Valparaiso, and was never again heard of.

THE PRESIDENT, left Australia in 1860 and was not heard of again.

THERMOPYLAE (3711), passenger s.s., Aberdeen White Star Line, London to Australia, while trying to arrive at Cape Town during thick weather, was stranded near Green Point and became a total wreck, 13 September 1899. No lives were lost.

THE SISTERS (or *Two Sisters* or *Sisters*), cutter, of Sydney, sandalwood trader, was captured and destroyed, and her crew (10 men) killed, by natives of Keama, Maré Island, Loyalty group, about October 1843.

THISTLE (139), schooner, of Sydney, was wrecked in the Solomons, 9 November 1894.

THISTLE (2284), 4-masted barque, from Portland, Oregon, to Port Pirie with timber, was wrecked on Palmerston Island, north-west of Rarotonga, Polynesia, 8 November 1905, with no lives lost.

THOMAS KING (346), ship, was wrecked on Cato Island, Coral Sea, April 1852, on a voyage from Sydney to Manila.

THOMAS RUSSELL (151), s.s., was wrecked at Oreti Point, New Zealand, 4 February 1885. She struck an uncharted rock, but the master had failed to take ordinary precautions for safety.

THREE BROTHERS (24), lighter, was wrecked at Poverty Bay, New Zealand, August 1888.

THULE, American whaler, was wrecked on Minerva or Booby Shoals, near Bellona Shoals, Coral Sea, 11 September 1844. The master's and second mate's boats arrived at Moreton Bay. The chief mate's boat is believed to have landed to the northward and all hands to have been murdered by the blacks.

THURSO (490), barque, of Newcastle, was wrecked at Greymouth, New Zealand, August 1895.

THYRA, brig, stranded on Western Reef, Suva Harbour, Fiji, 8 December 1884. She attempted to enter without a pilot, and the wind failed.

THYRA (255), brig, of Melbourne, was wrecked at the Mauritius, October 1888.

TICKLER, Sydney to India, was lost near Manila, 18 October 1839.

TINTENBAR (668), s.s., chartered to the New Guinea administration, stranded on a reef and was abandoned on the coast of New Ireland, Pacific Ocean, 2 May 1924.

TISNAREN (5747), motor s.s., was damaged by collision off Gibraltar, on a voyage from Australia, 11 August 1924.

TITANIA (1031), brigantine, was wrecked on Dumbea Reef, New Caledonia, 23 August 1914.

TITUS (517), s.s., of Sydney, was converted into a hulk in 1907 at Vila, New Hebrides, and was towed out to sea and sunk, March 1919. She was for many years an island trader from Sydney.

TOWER HILL (181), brig, of Melbourne, was abandoned at Dunedin in 1877.

TRAFALGAR, London to Sydney, was lost at the Cape of Good Hope in 1839.

TRAFALGAR (800), ship, Dunbar Line, foundered in 20° N., 32° W., while bound from Australia to London, May 1860. She had leaked badly for several days. One boat's crew was rescued, but nothing was ever heard of the others.

TRAFALGAR (1768), 4-masted barque, from Sydney to Falmouth with wheat, was wrecked near Tamandra, on the Brazilian coast, November 1904. No lives were lost.

TRECARRELL (8456), s.s., stranded near Cape Guardafui while on a voyage from Australia to Europe, 30 August 1924. She was refloated later.

TRELEVAN FAMILY (198), brigantine, of Newcastle, was lost on a reef in the Solomon group, 23 January 1880, the master having used every means to avoid wreck.

TREVESSA (3566), s.s., from Australia to England, after rough weather sank in the Indian Ocean, 1200 miles from Western Australia, 4 June 1923. The crew left in 2 lifeboats; on 27 June one arrived at Rodriguez Island, and on 30 June the other arrived at the Mauritius, 33 lives being saved out of 44, after sailing about 3000 miles.

TRICHERA (1003), Swedish barque, left Bunbury, Western Australia, for East London, South Africa, with timber, and was wrecked near Durban, June 1905.

TRIUMPH, s.s., was lost on Tiri Tiri Islands, New Zealand, 29 November 1883.

TRUGANINI (130), s.s., stranded on rocks off Tern Island, Queensland, 29 August 1883. She was wrecked in a hurricane at Anelcahaut Harbour, Aneityum Island, New Hebrides, February 1891.

TRUSTY (59), lighter, was wrecked at Port Ahuriri, March 1914.

T. S. MORT, s.s., sank off the New Zealand coast in 1863. She was constructed from the burnt ship *Sovereign of the Seas* in 1861. See Section II.

TUBAL CAIN, schooner, was lost on Ono group, Fiji, 27 October 1878.

TUI, s.s., stranded near Pencarrow Head, Wellington, 1 November 1886, through reckless navigation of the master, whose certificate was cancelled.

TWEED (1745), built at Bombay in 1852 as a steam paddle-wheel frigate for the Indian navy under the name of *Punjaub*, was sold in 1862 to Willis, who changed the name to *Tweed* and placed her as a sailing ship in the Australian trade, where she continued until 1888. She then left Sydney for China and then to New York, but was dismasted off Algoa Bay, where it was found that she was seriously damaged. She was therefore broken up, and part of her timbers form the roof of a church in Port Elizabeth.

TWO SISTERS. See *The Sisters*.

TYNE, barque, was lost in Cook Strait, near Cape Terawhiti, August 1845.

TYRIAN (220), barque, of London, from Honolulu to Auckland and Sydney, left Auckland and was wrecked at night on Elizabeth Reef, Tasman Sea, 25 November 1851. One boat with people arrived at Newcastle, 2 December. The whaler *Jane*, of Sydney, took away 17 passengers, 30 November, and H.M.S. *Acheron* took the remainder, 9 December. No lives were lost.

TYRONE (6664), s.s., formerly *Drayton Grange*, stranded and was wrecked on Otago Heads, 29 September 1913.

ULTONIA, passenger ship from London, left for Melbourne, and was never heard of again, November 1857.

UNDINE (800), clipper ship, in the China trade, built 1867, sailed from London to Brisbane in 1873. Thence she proceeded in ballast towards Foochow, 15 May 1873, and has not since been heard of.

UNION (158), brig, of Hobart, was wrecked at Whangaroa, New Zealand, August 1873.

URUROA (196), schooner, of Auckland, was wrecked at Wanganui, December 1908.

UUETEA, constant trader to Sydney, was lost on the New Zealand coast, 3 February 1840.

VALETTA, ship, was wrecked in the Pelew Islands in 1826.

VALKYRIAN (1123), ship, formerly New Zealand Shipping Co.'s *Waimate*, was sold to Russians, renamed *Valkyrian* in 1899, loaded coal at Newcastle for Iquique in 1899, and was never again heard of.

VANGUARD, schooner, sandalwood trader. In October 1847 the master and 8 men were killed by natives near Noumea, New Caledonia. The remainder escaped with their vessel.

VENTNOR, s.s., foundered off New Zealand, 25 October 1902.

VENTURE (54), schooner, of Sydney, was wrecked on Chesterfield Reefs, Coral Sea, near New Caledonia, August 1879.

VENUS, brig, was wrecked on Alert Reef, Coral Sea, in 1826, having drifted upon it while lying to at night, when a strong current was setting her on to the reef.

VIBILIA (108), schooner, of Sydney, was wrecked in the Louisiades, SE. New Guinea, September 1880.

VICTOR, Norwegian ship from Tasmania to Malden Island, was wrecked in mid-Pacific in a hard westerly gale which parted her moorings, 19 May 1905. (See *Salamis*. No lives were lost.

VICTORY (1100) s.s., on Melbourne and New Zealand trade, was wrecked in Wickliffe Bay, Otago, 3 July 1861.

VIKING, schooner, of Sydney, in the island trade, was wrecked on Santa Cruz group, March 1907. No lives were lost.

VILLE DU HAVRE (2446), 4-masted French barque, was driven on to reefs off New Caledonia in a hurricane, January 1901. She was refloated and repaired in Sydney. Again she stranded on reefs near Amedee lighthouse, New Caledonia, February 1905, but was towed off next day and again repaired in Sydney.

VINCENT (20), cutter, of Auckland, was wrecked and broken up at Noumea, March 1880.

VINDEX (290), barque, of Newcastle, was wrecked at Kaipara, New Zealand, March 1882.

VITTORIA, Sydney to New Zealand, was lost on the New Zealand coast, March 1840.

VOLUSIA, Sydney to Scotland, was lost on the coast of South America, 13 October 1830.

VOURA, small s.s., was attacked at Brooker Island, SE. New Guinea, by natives who killed 8 of the crew, November 1878.

WAIITI (688), barque, stranded while leaving the wharf at Kaipara to load at Hokianga for Melbourne, and became a total wreck, 28 January 1907.

WAIKARE (1901), Union s.s., struck an uncharted rock in Dusky Sound, New Zealand, 4 January 1910, and was totally lost. There were 270 passengers aboard, but no lives were lost.

WAIKATO, s.s., was burnt and scuttled, 23 February 1875.

WAIKATO, s.s., from London to New Zealand, when south of Agulhas broke her tail-shaft, June 1899, and drifted 4000 miles to eastward until taken in tow in August by s.s. *Asloun*, who towed her to Fremantle, nearly 3000 miles.

WAIMATE, ship. See *Valkyrian*.

WAIMATE (5610), New Zealand s.s., from New Zealand to England. Fire broke out, but was successfully kept under for about 10 days, when she was discharged in London, June 1906.

WAINUI, sank in Port Chalmers, New Zealand, 22 January 1870.

WAIRARAPA (1023), s.s., from Sydney to Auckland, was wrecked in a fog on Great Barrier Island, near Auckland, 29 November 1894, with 125 lives lost.

WAIREKA (103), schooner, was wrecked at Hokianga, New Zealand, March 1886.

WAIREKA (99), schooner, of Auckland, was wrecked at Long Island, May 1892.

WAIRUA, s.s., of Auckland, was wrecked near Pipiriki, Wanganui, 1 March 1910, with a number of Australian tourists aboard. No lives were lost.

WAITAKI (288), s.s., was wrecked at Bleak Head, New Zealand, 22 April 1887, through steaming full speed in thick weather.

WAITARA (1012), ship, of Lyttelton, stranded on Triangle Rocks, Bluff Harbour, 11 March 1881. She sank in a collision off Portland, English Channel, with the ship *Hurunui*, 22 June 1883. 20 people were drowned. Both ships were owned by the New Zealand Shipping Company.

WAITOTARA, s.s. See Section IV.

WALLACE (108), s.s., stranded at the entrance to Hokitika River, 19 April 1885, in consequence of a heavy sea. She was totally wrecked at Greymouth, New Zealand, October 1885.

WALRUS, dredger, purchased from Natal for Geelong, left Durban, August 1906, and was never heard of again. Also see *Octopus*.

WANAKA (278), s.s., was wrecked at New Plymouth, April 1891.

WARATAH (9000), twin screw s.s., Lund's Blue Anchor Line, built in 1908, on her second voyage left Adelaide for London, 7 July 1909, coaled at Durban and left for Cape Town on 26 July. On the following day she was spoken by s.s. *Clan MacIntyre*, but has not since been seen. 211 lives were lost, including 92 passengers. She probably capsized in a heavy westerly gale on 28 July, when off the South African coast.

WARATAH, barque, was wrecked off Ushant, France, 16 February 1848, when outward bound to Sydney, New South Wales. 13 lives were lost.

WARO (34), schooner, of Auckland, was wrecked on Waipu Beach, North Island, New Zealand, May 1916.

WATER LILY (263), brig, of Newcastle, was wrecked in the East Indies, 16 May 1880, through strong current. Inquiry was held at Surabaya.

WATERLOO (414), ship, London to Hobart, with 219 convicts aboard, anchored, parted cables, and was wrecked in Table Bay, 28 August 1842. She smashed up in less than two hours. 190 people were drowned; convicts 143, crew 29, women and children 18.

WATERMAN (113), schooner, of Melbourne, was wrecked at Little Ho Ho Creek, New Zealand, July 1871.

WAVE (174), brig, was wrecked at Kaipara, New Zealand, January 1885.

WEATHERSFIELD (1047), ship, was in the inter-

colonial trade from 1896 to 1909, when she sailed to Suva and was converted into a hulk.

WELCOME (62), schooner, of Auckland, was wrecked at Whakatane, New Zealand, in 1916.

WELCOME HOME (109), schooner, was lost on a reef, after parting cable, on the western side of Marakai Island, Gilbert group, 5 June 1877.

WELLINGTON, brig, was captured by convicts, December 1826, while on a voyage from Sydney to Norfolk Island. They took her to New Zealand, where she was recaptured by the whaler *Sisters*, January 1827, and brought back to Sydney.

WELLINGTON (587), barque, of Auckland, was wrecked at Yokohama, September 1881.

WEST AUSTRALIAN (545), barque, of Lyttelton, was wrecked off New Caledonia, 9 August 1904, while going from Noumea to Surprise Island. No lives were lost. She was well known in the Australian trade.

WESTERN STAR (179), brig, was lost on Bampton Reef, Coral Sea, 28 January 1878. Two boats with all the crew safely navigated 550 miles to the Queensland coast.

WESTLAND (1116), ship, Shaw Savill Co., from Otago to London, stranded near St. Alban's Head, English Channel, 4 March 1887, through neglecting to use the lead in thick weather.

WHANGAROA (132), scow, from New Zealand to Sydney, was abandoned and foundered near Lord Howe Island, 23 June 1911. All hands landed at the island safely from boats.

WHIRLWIND (868), ship, from Hong Kong to Melbourne, stranded on Brewer's Reef, SE. New Guinea, March 1870. At a board of inquiry officers and crew averred that she was wilfully run ashore, but the board considered that the casualty was accidental.

WILD DEER (1016), composite ship, Albion Shipping Co., built in 1863, when outward bound with emigrants for New Zealand, January 1883, was wrecked on the Irish coast.

WILD DUCK, English ketch, had her boat's crew killed by natives of SW. Santo, New Hebrides, in 1870.

WILD WAVE (173), brig, of Sydney, was wrecked at Kaipara, New Zealand, May 1890.

WILLIAM, ketch, was wrecked in Nelson Bay, New Zealand, August 1874.

WILLIAM ACKERS (299), barque, of Newcastle, was wrecked at Waipara, New Zealand, December 1876.

WILLIAM DENNY, s.s., stranded and was wrecked at North Cape, New Zealand in 1858, while on voyage from Auckland to Sydney. She was successfully refloated but a few hours later was wrecked.

WILLIAM GIFFORD (232), barque, of Dunedin, was wrecked near Mataura River, New Zealand, May 1877.

WILLIAM MCLAREN (560), barque, of Newcastle was wrecked in Wellington Harbour, New Zealand, October 1889.

WILLIAM MISKIN (124), paddle s.s., arrived at Melbourne from England in 1853, and was wrecked at Hokitika, New Zealand, August 1866.

WILTSHIRE (12,160), s.s., Federal S.N. Co., London to Auckland, ran ashore during dirty weather and became a total loss on Great Barrier Island, near Auckland, New Zealand, 31 May 1922. No lives were lost, all landing with great difficulty on the cliffs two days later.

WINDHOVER (207), brig, of Sydney, sprank a leak after leaving Newcastle and was abandoned between Sydney and New Zealand, November 1874, with all hands saved.

WINDSOR, ship, London to Sydney, was wrecked on Bonavista Island, Cape Verde Islands, 5 December 1857. A board of trade inquiry held that the master had no criminal intention to lose his ship, but that he did not use proper precautions to ensure her safety.

WINEFRED (79), schooner, of Auckland, was wrecked at Rotumah Island, between Fiji and Ellice groups, February 1892.

WITCH OF THE WAVE, barque, was lost on a reef near Choiseul Island, Solomons. Inquiry was held at Sydney, 19 November 1877. She drifted on the rocks in consequence of the wind falling.

W. J. PIRRIE, 4-masted ship, carried nearly 4000 tons of coal from Newcastle to Tocopilla, Chile, where she was destroyed by fire, August 1904, after discharging most of her cargo.

WOLVERENE (207), brig, of Hobart, was wrecked at Bird Island, Pacific, June 1879. (Probably this is Reitoru Island, in the Low Archipelago).

WOLVERENE, H.M.S., wooden ship, arrived in Australia in 1877, was sold from H.M. service and loaded with coal for South America. Her seams opened, and she put into Auckland, where she was condemned, March 1895.

WONGA WONGA, s.s., was wrecked near Grey River, west of South Island, New Zealand, May 1866.

WOODALL, ship, of Liverpool, from London to Calcutta and Sydney, while towing down the Thames, 24 April 1844, was found to be on fire and had to be scuttled off Tilbury. No lives were lost.

WOODLARK, brig, from Hobart to the Cape of Good Hope via Torres Strait, was wrecked on (probably) Saumarez Reefs, Coral Sea, 18 April 1828. 6 lives were lost on a raft; a boat with the remaining 18 people, after great hardships, reached Brisbane, 14 May.

WOODVILLE (740), barque, came into collision with s.s. *Rodondo* off Port Jackson, 6 December 1881. While on a voyage from Liverpool to Otago she was wrecked by stranding in St. George's Channel, 25 February 1882, with loss of several lives.

WOOLLAHRA (942), barque, owned by Cowlishaw of Sydney, was wrecked near Cape Terawhiti, New Zealand, July 1907. 2 lives were lost, one being the master.

YARALLA (303), s.s., of Sydney, was wrecked in the Fiji Islands, August 1906.

YARRA, barque, was wrecked on Scott Reef, Arafura Sea, 16 January 1884. Inquiry was held at Melbourne. She had drifted on to the reef in a heavy gale.

YATALA (1127), Orient composite clipper ship, built in 1865, was wrecked at Cape Gris-Nez, English Channel, March 1872, when homeward bound from Adelaide. All lives and most of her wool cargo were saved.

YOLANDE (395), brigantine, of Wellington, was wrecked at Westport, New Zealand, August 1897.

YOUNG DICK (162), Queensland labour vessel, while at anchor off Malaita (Solomons), May 1886, was attacked by natives, who killed 3 of the crew, but were driven off with a loss of 20. In July 1886 she left Maryborough and was lost a few days later with all hands. Wreckage was found on Hinchinbrook Island (Queensland coast). About 170 lives were lost.

YSABEL (330), s.s., of Sydney, was wrecked at Namu Island, Marshall group, June 1907.

ZENO (390), brigantine, of Auckland, from Newcastle for Wellington, foundered off Lord Howe Island, 16 September 1895. No lives were lost.

ZEPHYR, when at Epi Island, New Hebrides, about 1874, had her boat's crew killed and eaten by natives.

ZEPHYR (65), Queensland schooner, had all her crew killed at Kangopassa, Choiseul Island, Solomons, and was burnt by natives, October 1880.

ZULIEKA, ship, was wrecked at Cape Palliser, New Zealand, 15 April 1897, with 9 lives lost.

SECTION IV

LOSSES CAUSED BY THE WAR, BETWEEN 1914 AND 1919, OF VESSELS WHICH WERE ENGAGED IN AUSTRALIAN TRADE PRIOR TO, OR DURING, THE WAR.

ACHILLES (7043), Holt's Blue Funnel s.s., was torpedoed and sunk, April 1916.

A E 1, H.M.A. submarine vessel, was lost with 34 crew, 12 September 1914, off Cape Gazelle, New Britain. No trace was ever found.

A E 2, H.M.A. submarine, was sunk in the Sea of Marmora, 30 April 1915, by a Turkish torpedo-boat after a fight of 2 hours. All the crew were saved by the Turks.

AFRIC (11,999), White Star s.s., for a number of years trading to Australia, was torpedoed and sunk, 13 February 1917, with 22 of her crew killed or missing and 144 saved.

AORANGI (4268), R.M.S., in Sydney-Vancouver run from 1897 to 1914, proceeded to England, was taken over by the admiralty, and was scuttled at Scapa Flow with other vessels to form a barrier against submarine attack. In 1921 she was raised and converted into an admiralty hulk moored in Scapa Flow.

APARIMA (5700), s.s., Union S.S. Co.'s cadet training-ship, was sunk by a torpedo off Anvil Point, English Channel, 18 November 1917. 57 of the crew were lost, including 17 cadets; 58 lives were saved in boats.

ARABIA (7933), P. and O. s.s., from Australia to London with passengers, with 720 people aboard, 169 being women and children, was torpedoed in the Mediterranean, on 6 November 1916. 11 of the crew were killed, the remainder saved in boats.

ARCADIAN (8900), formerly Orient s.s. *Ortona*, transport, was torpedoed in the Mediterranean, 15 April 1917, with nearly 300 lives lost.

ASHBURTON (4445), Australian S.S. Co., from Wellington to London, was torpedoed and sunk at the entrance to the English Channel, 1 April 1916. No lives were lost, although she was hit by 15 shells.

ATHENE (2470), German 4-masted barque, was seized at Newcastle, August 1914, and was sunk by the enemy about 1917.

AUSTRALBUSH (4400), Australian Commonwealth s.s., left Havre in ballast in convoy for the Bristol Channel, and while off Portsmouth was torpedoed and sunk, November 1917. The whole of the crew got away

in the boats and were safely landed, except one of the engineers, drowned.

AUSTRALDALE (4400), Australian Commonwealth s.s., with coal from Wales for Gibraltar, while in convoy was torpedoed off the north-western point of Spain in October 1917. 3 boats got away, including the lifeboat, which had about 27 men on board. No further news was received of the lifeboat, but the two other boats, with about 7 or 8 men, landed within 50 miles of each other on the north-western coast of France. There were 2 deaths in the boats.

AUSTRALIA (18,800), H.M.A.S., first Australian battle-cruiser, arrived in 1913. After honourable service in the Pacific and the North Sea throughout the war, she was, by the terms of the disarmament treaty, dismantled in Sydney in 1923-24 and was towed to sea and sunk, 22 miles east of Port Jackson, 12 April 1924. See AUSTRALIA, H.M.A.S.

AUSTRALIEN (6400), Messageries Maritimes s.s., was torpedoed and sunk in the Mediterranean, 19 July 1918.

BALLARAT (11,000), P. and O. s.s., with reinforcements for the Australian Imperial Force, was torpedoed at the entrance to the English Channel, 25 April 1917. All lives (1732) were saved. The ship sank next day.

BARUNGA (4000), Australian Commonwealth s.s., loaded general cargo in London for Australian ports and proceeded to Plymouth to join convoy. She left Plymouth in convoy and was torpedoed about 12 hours later. She remained afloat for some hours, but finally sank. Her people, about 900 in all, were landed shortly afterwards without accident, about the end of March 1918.

BELUGA (508), barque, was captured and sunk by the German raider *Wolf* off Fiji, July 1917.

BERRIMA (11,137), P. and O. Australian transport, was torpedoed, 18 February 1917, when 50 miles west of Portland Bill. Being seriously damaged and sinking, she was taken in tow by H.M. destroyer *Forester* and safely beached in Portland Harbour 24 hours later.

BRITISH YEOMAN (1953), barque, was sunk by the German raider *Seeadler* in 1917.

CARL RUDGERT VINNEN (2903), German 4-masted barque, was seized in Newcastle, August 1914, and was sunk by the enemy about 1917 in the war zone.

CLAN MACTAVISH (5816), s.s., with cargo from Australia, made a gallant fight with the *Moewe*, 16 January 1917, off the Canary Islands. 18 of the crew were killed, and several Germans. The ship then sank.

COLLINGWOOD (1011), Devitt and Moore's Australian clipper ship, built in 1872, was sunk by a German submarine, March 1917.

CUMBERLAND (9471), s.s., of Sydney, for London, struck one of the German raider *Wolf's* mines off Gabo, 6 July 1917, and was beached on Gabo Island. By salvage operations she was temporarily repaired and started in tow to Eden, 12 August, but sank off Green Cape.

DECAPOLIS, barque. See Section V.

DEE (1169), ship, from the Mauritius to Bunbury, Western Australia, was sunk in the South Indian Ocean by the German raider *Wolf* in 1917.

ECHUNGA (3863), s.s., of Adelaide, was torpedoed in the English Channel, September 1917.

EMDEN (3590, with 10 4-inch guns), German light cruiser, was destroyed by H.M.A.S. *Sydney*, off Keeling Island, Cocos, 9 November 1914. See NAVAL DEFENCE.

ENCORE (651), American schooner, bound from Puget Sound to Sydney, was captured and burnt by the German raider *Wolf* off Hunter Island, SW. of Fiji, July 1917.

ERA (1550), s.s., was torpedoed and sunk, June 1918.

ERNST (2285), German 4-masted barque, was seized at Newcastle, August 1914, and was lost on the western coast of South America about 1917.

GEELONG (7951), P. and O. s.s., Australian trader, was sunk by collision with s.s. *Bovilston*, in the Mediterranean, 3 January 1916, with no lives lost. The vessels showed no lights, as a war precaution.

GRENADA (2268), 4-masted barque, Sydney to London, was torpedoed in 1917 in the English Channel after discharging her wheat cargo at Havre. The crew landed safely.

INDIA (8000), P. and O. s.s., armed cruiser, was sunk by a torpedo from a submarine while on patrol duty off Norway, 8 August 1916. 116 lives were lost, 189 saved.

ITONUS (5340), British India S.N. Co., was torpedoed, 20 December 1916, with 5 lives lost.

KAIPARA (7392), New Zealand Shipping Co., was sunk by the German cruiser *Kaiser Wilhelm der Grosse*, near the Canary Islands, while bound from New Zealand to England with frozen meat, 16 August 1914. No lives were lost.

KAPUNDA (3383), owned by Melbourne S.S. Co., was torpedoed off Malta, 12 November 1916.

KYARRA (4383), s.s., while on her way to Australia with invalid soldiers, was torpedoed and sunk in the Channel, off the Isle of Wight, June 1918. 9 lives were lost.

LOCH TORRIDON (2000), iron clipper ship, built in 1881, made frequent voyages to Australia until sold to Russians in 1912. She sank in the Chops of the Channel, January 1915, probably torpedoed by a German submarine.

MALOJA (12,431), bound for India, struck a mine off Dover and sank quickly, 27 February 1916. 122 lives lost, 301 saved. She was carrying passengers and mails.

MARMORA (10,500), P. and O. s.s., armed cruiser, was torpedoed and sunk, 29 July 1918. 10 lives were lost.

MATUNGA (1015), s.s., of Sydney, from Sydney to Rabaul, was captured by the German raider *Wolf* when north of Woodlark Island, south-eastern New Guinea, 5 August 1917. She was taken to north-western New Guinea, pillaged, and sunk. Passengers and crew were taken prisoners to Germany.

MEDINA (12,350), P. and O. s.s., from England to Australia, was torpedoed at the entrance to the English Channel, 28 April 1917. All the passengers and crew, except 5 men, were saved.

MOLDAVIA (9500), P. and O. s.s., armed cruiser, with American troops for France, was torpedoed and sunk, 27 May 1918. 56 troops were lost.

MONGARA (8205), s.s., British India S.N. Co., Melbourne for London, was torpedoed near Messina, and sank in 10 minutes, but all the 210 people aboard were saved, 3 July 1917.

MONGOLIA (9500), P. and O. s.s., London to Sydney, struck a mine laid by the *Wolf* off Bombay, and sank in 13 minutes, 23 July 1917. Passengers and crew landed in boats; 23 out of 470 people aboard were lost.

MOOLTAN (10,000), P. and O. s.s., from Australia to England with passengers and mails, was torpedoed in the Mediterranean, 26 July 1917. All aboard (554) were saved.

MORESBY (1763), late Burns, Philp and Co.'s s.s., was torpedoed and sunk in the Mediterranean while returning to China for more Chinese labourers, November 1916.

NORFOLK, s.s. See Section II.

OLINDA. See *Cardinia* in Section III.

ORAMA (12,927), Orient Line, armed cruiser, was torpedoed and sunk, 19 October 1917, with no lives lost.

OTAKI (9575), New Zealand Shipping Co., from London to New Zealand, made a most gallant fight in the mid-Atlantic with the raider *Moewe*, whom she severely damaged, before being sunk herself, 10 March 1917. 13 of her crew were killed and wounded. The German casualties were 15.

OTRANTO (12,124), s.s., Orient Line, transport, collided with the transport *Kashmir* in the Irish Sea and became a total wreck. About 340 American troops and 85 of the crew were lost.

OTWAY (12,000), s.s., Orient Line, armed cruiser, was torpedoed and sunk in northern waters, 22 July 1917. 10 lives were lost.

PEGASUS (2000), H.M.S., small old light cruiser, on Australian station prior to the war, while lying at anchor at Zanzibar, with no steam up, was shelled and sunk by the German cruiser *Konigsberg*, 20 September 1914. 24 were killed, 55 wounded, 7 died of wounds, while gallantly trying to fight the enemy, who never came within range of her guns.

PERSIA (7974), London to Bombay with 201 passengers and 317 crew, was torpedoed and sunk in the Mediterranean, 30 December 1915. 167 were saved, 334 lost. Survivors were rescued in boats by the mine-sweeper *Mallow*, which has since been presented to Australia.

PONRABBEL (185), dredge, of Lyttelton, was sunk by the German cruiser *Emden* in 1914.

PORT ADELAIDE (8181), Commonwealth and Dominion Line, England to Australia, was torpedoed at the entrance to the English Channel, 3 February 1917. 6 boats with crew were rescued by a Dutch s.s. and landed at Vigo.

PORT JACKSON (2132), built in 1882 for W. Duthie, sold in 1906 to become Devitt and Moore's cadet training-ship from 1907 to 1914, on the outbreak of war ceased to carry cadets and was torpedoed in the English Channel in 1916. She had been badly damaged by fire at Central Wharf, Sydney, 24 May 1893.

PORT KEMBLA (4700), s.s., from Australia to Wellington, sank off Cape Farewell, near Cook Strait, New Zealand, through striking one of the German raider *Wolf's* mines, 18 September 1917.

PORT NICHOLSON (8418), Commonwealth and Dominion Line, was torpedoed and sunk on the home-

ward voyage from Sydney to London. She left Sydney 8 November 1916.

SEEADLER (1571), formerly *Pass of Balmaha*, ship fitted with powerful Diesel engines, German raider, was wrecked on Mopelia Island, Society group, August 1916. The captain and part of the crew were captured and interned in New Zealand.

SOCOTRA (6009), P. and O. s.s., from Australia to London, stranded and became a total loss near Le Touquet, France, owing to her master mistaking that light for Beachy Head, 25 November 1915. No lives were lost.

SOUTHBOROUGH (2368), s.s., was sunk by the enemy in the North Sea, July 1918. She had previously been trading on the Australian coast.

SOUTHPORT, s.s., of Cardiff, was captured, August 1914, by the German corvette *Geier* who dismantled her engines and left her at Kusaie in the Caroline group. Her engineers got the engines working again and she escaped and arrived at Brisbane, 29 September 1914.

THOMAS STEPHENS. See Section V.

TYMERIC (3314), Andrew Weir's s.s., from Java to England, was captured and sunk off Ceylon by the German cruiser *Emden*, 25 September 1914. No lives were lost.

UNDOLA (185), s.s., possibly struck a floating mine between Bellambi and Sydney, December 1916. She became missing with all hands.

VILLE DE LA CIOTAT (6392), French Messageries Maritimes passenger ship to Australia, was sunk by a torpedo in the eastern Mediterranean, 24 December 1915, with 80 lives lost.

WAIHEMO (4283), s.s., Union S.S. Co., was torpedoed in the Mediterranean, March 1918, all the crew being saved in boats.

WAIRUNA (3947), Union S.S. Co., Auckland to San Francisco, was captured and sunk by the German raider *Wolf* off Sunday Island, Kermadec group, June 1917. The crew were taken prisoners to Germany.

WAITOTARA, Union s.s., from San Francisco to Sydney. After she left Suva, 14 June 1917, fire broke out and rapidly spread. The crew were all saved in boats.

WARILDA (7713), Adelaide S.S. Co., hospital ship, carrying nearly 700 wounded across from France, was torpedoed and sunk in mid-channel, August 1918. About 120 lives were lost.

WIMMERA (1871), s.s., Auckland to Sydney, was sunk through striking one of the raider *Wolf's* mines off Farewell Spit, New Zealand, 26 June 1918. The master and several others were lost.

WINSLOW (567), American schooner, from Newcastle to Apia, was sunk by the raider *Wolf* off Kermadec group, June 1917.

ZELÉE (637), French gunboat, was sunk at Papiete (Tahiti) during bombardment by German cruisers *Scharnhorst* and *Gneisenau* on 22 September 1914.

SECTION V

THE LAST YEARS OR FINAL DESTRUCTION OF SOME WELL-KNOWN PASSENGER SAILING-SHIPS BETWEEN GREAT BRITAIN AND AUSTRALIA, WHICH WERE NOT WRECKED WHILE ENGAGED IN THAT TRADE.

ALEXANDER DUTHIE (1179), built in 1867, made many voyages to Australia, about 1890 was sold to Norway and renamed *Gunhilda*.

ANTIOPE (1443), iron clipper ship, launched in 1866, made many voyages to the Antipodes from London. In 1904 she was sold to the trans-Pacific trade, and in 1915 was resold in New Zealand and carried timber to Melbourne. She lay stranded off Bluff Harbour for 4 months in 1916, then was refloated and eventually burnt in Delagoa Bay, January 1921, whereupon she was converted into a storeship at Beira, East Africa.

ARGONAUT (1488), Carmichael's iron clipper ship, in Australian trade 1880-1900, was then sold to Portugal and renamed *Elmira*, and again in 1913 renamed *Argo*. She was broken up about 1918.

ARISTIDES (1661), Aberdeen White Star iron clipper ship, in Australian trade from 1876 till 1895, left Caleta Buena, Chile, with nitrate for San Francisco, 28 May 1903, and no trace of her has since been found.

ASCALON (938), Aberdeen White Star wooden clipper ship, was sold to Norway and wrecked at Annalong in 1907.

ASTORIA. See *Ben Nevis*.

AUSTRALIA, 4-masted barque. See *Phyllis*.

AVIEMORE (1091), Aberdeen White Star wooden clipper ship, was sold to Norway about 1890, and is possibly still afloat.

BEN CRUACHAN (1468), iron clipper ship, in Australian trade from 1873 to 1887, was sold, and ultimately converted into a hulk in Mexico.

BEN NEVIS (1061), one of Watson's passenger clipper ships, built in 1868, after making many voyages was sold to Norway in 1898 and renamed *Astoria*. She was abandoned on fire in the Atlantic in 1912.

BEN VOIRLICH (1474), iron clipper ship, in Australian trade from 1874 to 1891, was then sold to Germans, and afterwards to Italy. In 1918 she was moored at Leith and used as a hulk to accommodate German prisoners.

BEREAN (526), Walker's wooden barque, built in 1869, and trading for 27 years, chiefly to Tasmania, was sold to Norway in 1894. She came into collision in the Thames in 1910 and was converted into a hulk.

BRILLIANT (553), Duthie's wooden clipper ship, launched in 1850, was sold, and lost while bound from Callao. For a dozen years she was a very popular passenger ship to Melbourne.

BRILLIANT (1613), Duthie's iron clipper ship, known as Duthie's Yacht, built in 1877, was sold to Italians in 1905. She had a very good reputation in Australian trade for nearly 30 years. She was probably broken up at Genoa about 1912.

CARLISLE CASTLE. See Section II.

CENTURION (639), the first, built in 1850, Aberdeen White Star wooden clipper ship, became a total loss in 1866.

CENTURION, the second. See Section II.

CHAMPION OF THE SEAS (2448), Black Ball wooden clipper ship, built in 1854, a favourite passenger ship to Australia for a dozen years, was then sold. While homeward bound in 1877, from Pabellon de Pica to Queenstown, she became disabled and leaking, and was abandoned in 38° N., 30° W., 3 January 1877.

CHRISTIANA THOMPSON (1079), Aberdeen White Star wooden clipper ship, built in 1866, made many voyages until sold to Norwegians, who renamed her *Beatrice Lines*. She was wrecked in Norway, October 1899.

CIMBA (1174), Nicol's iron clipper ship, built in 1878, made many good voyages to Australia until sold in 1906.

CITY OF AGRA (1074), iron clipper ship, built in 1860, made many voyages to Australia in the seventies and eighties. She was sold, and was wrecked on Cape Sable, in 1907.

COLLINGWOOD. See Section IV.

COMET (1361). See *Fiery Star*, Section III.

CROMDALE (1903), the last of the wool clipper ships, launched in June 1891, made several voyages to Australia, was sold, and in 1913 was wrecked on the Lizard. All hands were saved by lifeboats.

CUTTY SARK (963), Willis's famous clipper ship, built in 1869, was considered one of the fastest ships ever built. She made a number of voyages to Australia until sold in 1895 to Portuguese, who renamed her *Ferreira*. She was bought from them in 1923 and re-rigged at Falmouth, where she now lies under her old name.

DAMASCUS (964), Aberdeen White Star wooden clipper ship, built in 1857, was sold to Norwegians and wrecked at Bersimis in 1893.

DECAPOLIS (632), Walker's iron clipper barque, in Brisbane and Launceston trade to London, was sold to Italians and was torpedoed in the Mediterranean about 1900.

DERWENT (1890), Devitt and Moore's iron clipper ship from 1884 to 1904, when she was sold to Norway, after establishing a great reputation in the Australian trade.

DHARWAR (1300), Willis's iron clipper ship, built in 1864, made many voyages to the Antipodes in the seventies, eighties, and nineties. She was sold to Sweden and was broken up in 1909.

DON JUAN (648), ship, of Dunedin, was converted into a coal hulk in Port Chalmers about 1876.

DOVER CASTLE (1008), ship, Green's Blackwall Line, London to Australia 1858 to 1871, was sold, renamed *Kem*, and wrecked on coast of Norway.

EDWIN FOX (836), wooden barque, East Indiaman from Calcutta, built in 1853 for Shaw Savill Co., made voyages to New Zealand. Her hull is now used as a landing-stage at Picton.

ETHIOPIAN (839), Aberdeen White Star wooden clipper ship, sold to Norwegians, was abandoned near the Azores, October 1894, picked up, and towed into St. Michael's and condemned.

GEORGE THOMPSON (1079), Aberdeen White Star wooden clipper ship, was sold to Chile and wrecked at Carlemapu, June 1902.

GREAT BRITAIN (3200), full-rigged s.s., a favourite passenger vessel from London to Melbourne from 1852 to 1872, was finally dismantled into a hulk at Port Stanley, Falkland Islands.

HALLOWE'EN (920), Willis's clipper ship, built in 1870 as a tea clipper, made a number of voyages to Australia. While bound from China to London, she was wrecked at Salcombe, Devonshire, 17 January 1887.

HARBINGER (1506), iron clipper ship, built in 1876 for Orient Line, Australian trade, was bought in 1890

by Devitt and Moore for use as a cadet training-ship, together with the *Hesperus*, under Lord Brassey's scheme, and so continued till sold in 1897 to Russians, who still used her as a training-ship.

HARLAW (894), Aberdeen White Star wooden clipper ship, was wrecked at Hong Kong in 1878.

HEATHER BELL (479), Orient wooden clipper ship, built in 1855, was broken up at Balmain, Sydney, in 1894.

HELEN DENNY (728), ship, built in 1866, made many voyages for Shaw Savill to New Zealand, was sold about 1890 and placed in the Australia-New Zealand trade until 1913, when she was converted into a hulk at Wellington.

HESPERUS (1777), iron clipper ship, built in 1873 for Orient Line, for Australia trade, was bought in 1890 by Devitt and Moore for a cadet training-ship, together with the *Harbinger*, under Lord Brassey's scheme, and so continued until sold in 1899 to Russians, who still used her as a training-ship.

ILLAWARRA (1887), Devitt and Moore's iron clipper ship from 1881, succeeded the *Hesperus* as one of Lord Brassey's cadet ships from 1899 to 1907. She was then sold to Norwegians, who abandoned her in the North Atlantic, March 1912. On 24 December 1904, outward bound to Adelaide, she came into collision off Gravesend and was beached, but was refloated for repairs the next week.

JAMES BAINES (2525), one of the fastest and most famous wooden clippers, Black Ball Line, owned by James Baines, made very fast passages to and from England and Australia in 1854-57, when she was sent to India with troops and on arrival again in Liverpool was burnt in the dock, April 1858.

JERUSALEM (901), Aberdeen White Star wooden clipper ship, was sold to Norway and foundered with all hands in the North Atlantic in 1893.

JOHN DUTHIE (1031), ship, caught fire on the day of her arrival in Sydney, 19 December 1867, was towed to Mosman Bay, and scuttled, but was refloated 4 days later. She was converted into a hulk in Scotland and renamed *Lumberman's Laddie* about 1880.

LA HOGUE (1331), Green's Blackwall Line and Devitt and Moore's Line, from 1855 to 1887 in Australian trade, was then sold and later converted into a coal hulk at Madeira, where she was broken up in 1897.

LIGHTNING. See Section II.

LINCOLNSHIRE (1000), Wigram's Blackwall ship, in Australian trade from 1864 to 1880, was then sold, and was wrecked 3 years later.

LOCH RANNOCH (1185), previously the *Clan Ranald*, iron clipper ship of the Loch Line, made many voyages to Australia. She was sold in 1907 to Norway and broken up a few years later.

LOCH TAY. See Section III.

LOCH TORRIDON. See Section IV.

MACQUARIE (1857), first named *Melbourne*, the last of Green's Blackwall Line, launched in 1875, was bought in 1887 by Devitt and Moore, who changed her name, and in 1897 used her as a cadet training-ship. She was sold in 1903 to Norwegians, who renamed her *Fotuna*, and about 1912 she was converted into a coal hulk in Port Jackson, where she still exists.

MARCO POLO (1625), first clipper ship (wooden) to make quick voyages to and from London and Australia, Black Ball Line, built in 1852, after many years was sold, and eventually was wrecked on Prince Edward Island, North America, August 1883. On 25 January 1854 she ran on to a shoal inside Port Phillip, but was towed off six days later.

MENSCHIKOFF (223), barque, for many years in the Sydney-Newcastle coal trade, was converted into a coal hulk at Lyttelton about 1880, and was broken up in 1905.

MERMERUS (1671), Carmichael's iron clipper ship, built in 1872, was sold to Russians in 1897, was stranded near Christiansand, and was broken up in 1910.

MILTIADES (1452), Aberdeen White Star iron clipper ship, built in 1871, was over 20 years in Australian and New Zealand trade. She was sold to Italy in 1895 and broken up in 1905.

MONARCH (1450), ship, Green's Blackwall Line to Australia and Shaw Savill Line to New Zealand, 1844 to 1870, was subsequently sold, sailed in 1876 from Bombay to Rangoon, and became missing with all hands.

MOUNT STEWART (1903), was launched in May 1891, and, with the *Oromdale*, is the last of the wool clippers. While discharging cargo at Miller's Point, Sydney, 7 October 1904, she caught fire and was beached in Berry's Bay and filled with water. She was refloated next day, and was sold to the French in 1924, ostensibly for breaking up.

NIMROD, s.s., of London, formerly Shackleton's vessel in his Antarctic expedition of 1907, was wrecked near Yarmouth (England) on a voyage from Blyth to Calais, 29 January 1919.

ORIENT (1033), pioneer ship of the present Orient S.S. Co., built in 1853, was sold in 1879, and is still used as a coal hulk at Gibraltar.

ORONTES (1318), Aberdeen White Star clipper ship 1880-95, and then sold, sank in a collision in the English Channel, October 1903. On 27 November 1886 she had been in collision off Kiama with the ship *Angerona*.

PARRAMATTA (1521), built in 1866 for Devitt and Moore, was in the Australian trade until 1888, when she was sold to Norwegians and broken up in 1899.

PATRIARCH (1339), Aberdeen White Star iron clipper ship, built in 1869, was a constant trader to Australia until sold to Norway in 1898. She was lost off Cape Corrientes in 1912.

PERICLES (1598), Aberdeen White Star clipper ship, launched in 1877, for years carried passengers to Australia, and also made voyages to San Francisco. She was sold to Norway in 1904 for the timber trade to Melbourne. Later she was renamed *Sjuroo*, and was broken up in 1923.

PHYLLIS (2246), 4-masted iron barque, owned in U.S.A., was sold to be broken up in London in 1925. She was built at Glasgow in 1886, named *Australia*, and for many years traded from England to Australia. She was then sold to Peruvians, who renamed her *Eliza Lihn*, was again sold and again named *Australia*, and again sold about 1916 to Americans, who renamed her *Phyllis*.

PORT JACKSON. See Section IV.

RODNEY (1447), Devitt and Moore's famous passenger ship from 1874 to 1897, was sold to France and lost on the Lizard in 1901.

ROTHESAY BAY (699), barque, of Sydney, was converted into a hulk, October 1921. She was for many years an Australian-New Zealand trader.

ROTOMAHANA (1727), s.s., of Auckland, built in 1876, was broken up, April 1924. She was a favourite fast passenger s.s., between Sydney and New Zealand for 40 years.

ROYAL DANE (1616), Black Ball Line wooden clipper ship, built in 1854, made many voyages to Australia until sold about 1875. She was wrecked on the Chile coast in 1877 when bound for Europe with guano.

SAINT VINCENT (892), Devitt and Moore's composite clipper ship, built in 1865, was sold to Norwegians about 1889.

SALAMIS. See Section III.

SAM MENDEL (1034), iron clipper ship, built in 1861, made many voyages to the Antipodes in the seventies and eighties. Sold, she was broken up in 1909.

SAMUEL PLIMSOLL (1444), Aberdeen White Star iron clipper ship, built in 1873, was in the Australian trade till 1899, when she caught fire in the Thames and was scuttled. Having been repaired, she ran to New Zealand till 1904, when she was sold and converted into a coal hulk at Fremantle.

SENORITA (324), brigantine, of Sydney, was converted into a hulk, April 1922. For many years she was a regular trader between Australia and New Zealand.

SOBRAON (2131), built in 1866, the largest composite ship, made many voyages under Devitt and Moore's flag until 1891, when she was sold to the New South Wales government. She is still afloat in Port Jackson as the naval training-ship *Tingira*.

SOPHOCLES (1120), a well-known Aberdeen White Star clipper ship until sold in 1895, still sails under the Italian flag.

STRATHDON (1011), Aberdeen White Star wooden clipper ship, was sold to Peru and broken up in 1888. When entering Port Jackson, 29 July 1867, the pilot boat capsized and 8 lives were lost. See *Pilot Boat* in Section II.

STRATHDON (2038), the second, formerly *Queen's Island*, made frequent voyages to Australia, 1890-1900, and was then sold to Norway.

SUCCESS (621), ship. See separate article on this vessel.

SUPERB (1451), built in 1866 for Green's Blackwall Line, remained in the Australian trade until about 1890, was then sold, and was broken up in 1901.

THERMOPYLAE (948), Thompson's Aberdeen White Star famous clipper ship, built in 1868, and generally considered the fastest ship ever built, made a number of voyages to Australia and thence to China until 1890, when she was sold to British Columbia. In 1895 she was bought by the Portuguese for a training-ship in the Tagus, until she was towed to sea and honourably sunk by gun-fire in 1907.

THOMAS STEPHENS (1507), iron clipper ship, launched in 1869, continued in the Australian trade until 1896, when she was sold to the Portuguese gov-

ernment for a training-ship in conjunction with the *Thermopylae*. In 1915 she was again sent to sea and became missing, having probably been torpedoed.

THYATIRA (962), Aberdeen White Star composite clipper ship, was sold, and was wrecked off Brazil in 1894. She came into collision with, and sank, the ship *Atmosphere*, with loss of lives, when off Rio de Janeiro, 27 January 1882.

TINGIRA. See *Sobraon*.

TORRENS (1276), Elder composite clipper ship, built in 1875, was a regular trader to Adelaide until 1903, when, being badly strained by a tempestuous homeward voyage, she was sold to Italy. She was broken up in 1910.

TORRIDON (1564), Nicol's iron clipper ship from 1885 to 1906, when she was sold to Italy.

TRANSATLANTIC (614), Aberdeen White Star wooden clipper ship, was sold to foreigners and foundered in the Atlantic in 1899.

TWEED. See Section III.

WAVE OF LIFE (887), Aberdeen White Star clipper ship, was sold, and was broken up 1897.

WHITE STAR (2339), one of the fastest of wooden clipper ships, built in 1854 for Liverpool-Melbourne emigrant trade, was wrecked in 1883.

WINDSOR CASTLE (1074), Green's Blackwall Line, built in 1857, remained in the Australian trade till 1882, when she was sold. She foundered off Algoa Bay, 25 July 1884, the crew being saved by the Norwegian barque *Ophir*.

WINDSOR CASTLE (979), Donaldson and Rose's wooden clipper ship, built in 1869, after 20 years' service was sold to Sydney and converted into a coal hulk as *Lumberman's Lassie*.

WOOLLOOMOOLOO (627), Aberdeen White Star clipper ship, was sold to Spaniards, and lost in 1885.

YALLAROI (1565), Nicol's iron clipper ship, from 1885 to 1906, was sold to Italy.

Wrenfordsley, SIR HENRY THOMAS, only son of J. H. Wrenfordsley of Dublin, was educated in France, at Trinity College, Dublin, and at the Middle Temple, and was called to the bar on 30 April 1863. For the next 14 years he worked at his profession in England, becoming in 1876 a deputy county court judge; in 1877 he was appointed a puisne judge in the Mauritius, leaving the bench in the following year to become advocate-general in the same colony. In 1880 he was transferred to Western Australia as chief justice, and administered the government of that colony from February to June 1883; he was then again transferred—this time to Fiji, where he became chief justice, and judicial commissioner for the western Pacific. In 1884, however, his health failed, and he was made acting judge in Tasmania (4 March 1885 to 14 February 1887); then, passing to Victoria, he acted as judge during part of 1888; and in 1890, during the absence of Chief Justice Onslow (q.v.) on leave, he was acting chief justice in Western Australia. Retiring at the close of that year, when the colony attained responsible government, he was in October 1891 made chief justice of the Leeward Islands. He retired from the service in 1901, returned to Australia, and practised for a time as a barrister in New South Wales. He died on 2 June 1908. (Kt. Bach., 1883.)

Wrens, small perching birds, with long tails usually carried upright, belonging to the genera *Malurus*, *Rosina*, and *Stipiturus*; all are peculiar to the Australian region. The true wrens (Troglodytidae) of Europe and America are not represented in Australia, but Australian wrens—which are generally placed in the family Sylviidae (warblers)—resemble them in the habit of carrying the tail upright, and on this account got their name from the early settlers. In addition to the birds here dealt with other so-called wrens are treated separately; these comprise ground-wrens, field-wrens, grass-wrens, and scrub-wrens.

By far the best-known of Australian wrens is the Blue Wren (*Malurus cyaneus*) of eastern Australia and Tasmania. This species, unlike its congeners, is a bold little bird; when its bush haunts are invaded by man, it soon makes itself at home in his garden, where its brilliant colouring, sprightly habits, and lively song ren-

Blue Wren (*length* 5 *in.*).

der it a general favourite. The male has brilliant cobalt-blue colouring on the head, cheeks, and back, the throat and back of the neck being black, the tail dark blue and the rest of the plumage brown; the female and young male are brown. All the young birds reared by a pair (which may have several broods in a season) keep together, so that a single brilliantly-coloured male is almost always accompanied by a considerable number of dull-coloured birds. This has given rise to the belief that the bird is polygamous, especially as some of the young birds of earlier broods occasionally assist in feeding young of later broods which are still in the nest.

The wrens build dome-shaped nests of dried grasses, lined with feathers or other soft materials and hidden in a tussock of grass or a low thorny bush. The eggs are three or four in number, white, sprinkled with reddish-brown spots. All the species associate in family parties like the common blue wren just mentioned, but the others are less bold in habits and are consequently much more rarely seen, even in districts where they are common. The brilliantly-coloured males, in particular, keep concealed among the bushes when their haunts are approached; but they have a considerable amount of curiosity, and if the observer remains quiet he will generally catch glimpses of them as they fly from one bush to another or hop rapidly along the ground. Ultimately his patience may be rewarded by a sight of the gorgeous little feathered gem perched on the top of a bush,

uttering its animated song. The wonderful coloration of these birds has suggested the name 'superb warbler,' by which they are sometimes known.

Perhaps the most completely blue birds in the world are the Black-backed Blue Wren (*Malurus melanotus*) of the inland districts of the eastern States, the Turquoise Wren (*M. callainus*) of southern central Australia, and the Banded Blue Wren (*M. splendens*) of the south-west, the males of all three species being almost entirely blue, of various shades, with some black markings. Another group of species has bright chestnut-red coloration at the sides of the back, with blue on the head and tail. Of these the Variegated Wren (*M. lamberti*) is found in Queensland and New South Wales, the Purple-backed Wren (*M. assimilis*) occurs throughout the inland districts of the eastern States, and the Red-winged Wren (*M. elegans*) and Blue-breasted Wren (*M. pulcherrimus*) inhabit south-western Australia.

The White-winged Wren (*M. leuconotus*), of the inland districts of southern Australia, is a blue bird with large patches of white on the shoulders. Exactly similar in pattern, but with the blue replaced by black, is the Black-and-white Wren (*M. leucopterus*) discovered on Dirk Hartog Island in Western Australia by the French naturalists Quoy and Gaimard in 1818. The specimens collected by these naturalists were lost in a shipwreck; and, as nothing agreeing with their description and picture had been found in Australia up to the end of the century, the

Emu Wren (*length 7 in.*).

bird remained a mystery to Australian ornithologists. However in 1901 a black-and-white wren was found on Barrow Island in north-western Australia, about 400 miles farther north; and in 1916 T. Carter obtained specimens on Dirk Hartog Island, thus after almost 100 years confirming the accuracy of the French naturalists' observations. The occurrence of a species on only two comparatively small islands 400 miles apart, closely similar in their physical features to much of the intervening mainland and intervening islands, is very remarkable and probably unique. The Red-backed Wren (*M. melanocephalus*) of northern and north-eastern Australia is a jet-black bird with a brilliant red back, a type of coloration quite distinct from that of its relatives. Another very distinctive form is the Purple-crowned Wren (*Rosina coronata*), found in the inland districts of northern Australia, the remarkable lilac shade of its head being almost unparalleled in nature.

The Emu Wren (*Stipiturus malachurus*) is noteworthy for its curious tail-feathers, which in structure resemble those of the emu—hence its name. It frequents swampy localities in eastern Australia and Tasmania, and reappears in the extreme south-west of the continent and on Dirk Hartog Island. It thus has a remarkably discontinuous distribution. The male has a bright blue throat and reddish-brown head. Two other species of emu wrens inhabit the dry scrubs in certain inland districts of Australia, these being the Mallee Emu Wren (*S. mallee*) of north-western Victoria, and the Rufous-crowned Emu Wren (*S. ruficeps*) of north-western Australia, whose range extends from North-west Cape to the western districts of the Northern Territory. This little inhabitant of the most arid part of Australia is the smallest of our birds in body, though, owing to its long tail, its total length exceeds that of several other species. W.B.A.

Wright, JOHN CHARLES, born at Bolton in Lancashire on 19 August 1861, was educated at Bolton and Manchester grammar schools and Merton College, Oxford (B.A., 1884; M.A., 1887; D.D., 1909). Ordained in 1885 (priest, 1886), he had charge of parishes at Ulverston and Leeds, became a residentiary canon of Manchester (1904-9) and archdeacon (1909); on 24 August 1909 he was consecrated archbishop of Sydney in St. Paul's cathedral, and on reaching Australia was in the following year elected primate of the Church of England in Australia.

Wrixon, SIR HENRY JOHN (1839-1913), eldest son of Arthur Nicholas Wrixon (who in later life was a county court judge in Victoria), was born in Ireland on 18 October 1839, brought to Melbourne in 1850, and was one of the earliest students at the university there. In 1858 he returned to Ireland, and after studying at the university of Dublin (B.A., 1861) was called to the bar, but came back and joined the Victorian bar in 1863. From 1868 to 1877 he was a member for Belfast, and solicitor-general in the McCulloch ministry from April 1870 to June 1871. From 1880 to 1892 he sat for Portland, (attorney-general in the Gillies-Deakin ministry, 1886-90) and was a delegate to the first federal conference in 1891. In 1896 he was elected to the legislative council, of which he became president (1901-10). He carried through several useful reforms in legal procedure, notably one that simplified dealings with small estates, and was an early advocate of proportional representation. Among his numerous political writings the most important is *Socialism; Notes on a Political Tour*, published in 1896 and reissued in 1906 with appendices. From 1903 to 1910 he was vice-chancellor of the university of Melbourne. He died on 9 April 1913. (K.C.M.G., 1892.)

Wyulda, a genus of the family Phalangeridae containing one species, *W. squamicaudata*, of which only a single specimen is at present known. It seems intermediate between *Phalanger* (the cuscus) and *Trichosurus* (the Australian opossum). Out of 11 important characters it shares five with the former and four with the latter, being unique as regards the other two; its hair is less frizzly than that of *Trichosurus* and less woolly than that of *Phalanger*, and its ears are intermediate in size between the two. For an opossum it is large, the head and body measuring about 16½ inches and the tail 12 inches. The body-hair is grizzled above and yellowish below; the tail is strongly prehensile, and haired scantily for about one-seventh of its length; the rest of the tail is covered with small thick separate scales that do not overlap, in colour dark brown, shading to yellowish at the tip. It has been surmised that *Wyulda* and *Phalanger* (some species of which have warty tails) are both closely related to the scaly-tailed muskrat-kangaroo (*Hypsiprymnodon*) which is found in the Herbert River district of Queensland. See MUSKRAT-KANGAROO.

The unique specimen, a female, was found alive at Violet Valley in the Kimberley district of Western Australia, and presented to the zoological gardens at Perth, but soon died. Its body (stuffed) and skeleton are preserved in the Perth museum.

X

Xanthorrhoea. See GRASS-TREES.

Xerotes, a genus of the family Liliaceae, endemic in Australia except for one species which extends to New Caledonia. It consists of tufted herbs with long, flat (or cylindrical) leaves, and small fleshy cream (or yellow) flowers on rigid stems, the sexes on distinct plants. In several species the floral arrangement of the sexes is dissimilar, the male flowers forming numerous clusters on a spike-like stem, whereas the females are collected in a globular head. *X. longifolia*, the largest, is the 'karawun' of the Victorian aborigines, who used its leaves for making baskets, etc. Many species have sweet-scented flowers.

Xylomelum, a genus of the family Proteaceae, endemic in Australia. The corolla is regular, the short concave lobes revolute and dilated; anthers shortly stalked, and inserted below the corolla segments; fruit large, ovoid, and woody, tapering above the middle, tardily opening along the upper side in 2 valves; seeds flat, with a scythe-shaped wing. The best-known species, *X. pyriforme* (Native or Wooden Pear), found in eastern Australia, is a small tree with numerous flowers in dense spikes; the young shoots are covered with rust-coloured hairs. The leaves on young plants are prickly-toothed, but, as the adult stage is reached, the teeth become obsolete—a common characteristic of Australian vegetation. The tree has a prettily-marked wood, occasionally used for picture-frames and walking-sticks. The bark is deeply furrowed and of a corky texture.

Y

Yabbie. See CRAYFISHES.

Yallourn. About 1917 the growth of Melbourne made it imperative to provide, in advance, an ample supply of electric power for its industries. An advisory committee appointed by the State government reported that a serious shortage of electrical energy was impending, and that supplies might be obtainable from one of the State's extensive brown-coal fields; experts at first favoured hydro-electric power, but little was known as to the available water-power, and many years of water-gauging and survey must elapse before the problem of an unfailing and adequate hydro-electric supply could be solved. Two deposits of lignitic brown coal were considered—one lying in the La Trobe valley in Gippsland, about 90 miles east of Melbourne, the other at Altona between Melbourne and Geelong, near Port Phillip. The choice lay between these fields, and after a thorough investigation the La Trobe valley scheme was adopted. This deposit had already been proved to extend over some 50 square miles, within 25 to 30 feet from the surface, and was calculated to contain 30,000 million tons—one bore in the area went through seven beds, disclosing an aggregate thickness of 781 feet.

The Victorian government therefore passed in 1918 an act for the establishment of a power-house on this field, then known as Morwell but since renamed Yallourn (a native name meaning 'yellow fuel'), and appointed a commission with wide powers to put the scheme into operation. Plans were prepared for a preliminary power-station of 50,000 kilowatts to supply energy pending the construction of the main station.

The site chosen for the main power-house was on the Latrobe River. As the coal was close to the surface, millions of tons of over-burden were removed, exposing a huge rectangular open cut of about 30 acres of brown coal (between 4,000,000 and 5,000,000 tons). The coal is excavated by steam and electric navvies, and delivered by conveyors to the screening-house at the rate of 2700 tons a day. At the screening-house the coal suitable for the power-house boilers is separated from the 'fines' and large lumps, which are sent to the briquetting factory. At the power-house are five turbines of the Metro-Vickers type, each of 12,500 kilowatts. Twelve boilers supply the steam for these turbines, which generate the electricity. When all are in commission they use 3500 tons of brown coal daily; the coal carries a high percentage of moisture, but the greater portion is eliminated by hot, ascending flue-gases in a patent stoker.

The generated electricity passes from the turbines to the control-transformer and switch-platform at 11,000 volts, and is increased for transmission to Yarraville—the main metropolitan distributing station—to 132,000 volts. The daily generation now amounts to 400,000 units. The main transmission line to the Yarraville distributing station is a three-phase aluminium conductor with steel core, 110 miles in length. In 1924 Yarraville distributed to Melbourne electricity to the amount of 58,147,655 kilowatt-hours.

The commission embodied in its scheme the erection of a briquette factory (completed in 1924) that should be capable of turning out 100,000 tons of briquettes per annum, thus rendering the Victorian public much less dependent upon outside sources of fuel. The screened coal already mentioned is delivered at the rate of 2000 tons per diem to a lofty 'wet' preparation floor, where it is reduced to lumps from 1 to 3 inches in diameter. The 'fines' pass to 1000-ton bunkers over revolving driers, which produce the exact percentage of moisture necessary for stable briquettes. Five German Zeitz presses, very like the ordinary rock-drill air-compressor, subject the coal to a pressure of about 1000 atmospheres per square inch. The product is a black, shining block, about 5in. x 2½in. x 1½in., containing about 15 per cent moisture and having a heating-power of 9500 B.T.U.—one-third as much again as box-wood fuel. Attached to the briquetting plant is a research laboratory and carbonizing plant for investigating the possibility of obtaining high-grade solid fuel, high-grade gas, and other products, at a cost that would justify the commercial exploitation of brown coal. At Yallourn the commission has built a township, with a high-level reservoir and purification works for the local supply. The local railway-line joins at Moe the main line from Bairnsdale to Melbourne.

The Victorian state electricity commission is composed of three commissioners and a chairman, Sir John Monash (q.v.), appointed by parliament. It has power to construct transmission lines and supply electric energy from Yallourn to all parts of the State. Power-transmission has been extended to the south-western and south-eastern districts of Victoria, and north towards the New South Wales border, local power-stations being absorbed in the great reticulation. A recent remarkable development in Australia, where State frontiers are usually regarded as sacred, is the extension of the Victorian power-supply across the border to Albury in New South Wales.

A scheme for the generation of hydro-electric energy is in course of preparation, and is expected to be in operation by the winter of 1927. Fourteen rivers have been systematically gauged. One of the main sources of hydraulic energy will be at Sugarloaf near the Dividing Range, east of the Melbourne-Sydney railway-line; this is known as the Sugarloaf-Rubicon scheme. Stations at Royston, Rubicon, Lower Rubicon, Snobbs Creek, and Sugarloaf will feed into a common sub-station eight miles from Sugarloaf. The total capacity of the hydraulic turbines to

be installed is 32,700 kilowatts, or about 43,000 horse-power. A useful supplement to the Sugarloaf scheme will be derived from streams in the Murrindindi district. Surveys have also been made of the Aire River in the Otway district, and of the Kiewa River near Albury. The estimated capacity of this northern hydro-electric scheme is approximately 30,000 kilowatts or over 40,000 horse-power. See HYDRO-ELECTRIC DEVELOPMENTS.

Yam, the popular name of several species of the genus *Dioscorea,* belonging to the small family Dioscorideae, which is found in tropical and temperate regions and consists of herbs with a tuberous root-stock, small greenish flowers and angular fruits. *Dioscorea* is mainly a tropical genus of shrubby twiners, turning to the left, with triangular leaves and slender spikes of insignificant flowers. The fruit-capsule is flat, 3-angled and broadly winged. Three species are indigenous to Australia. *D. sativa* (the plant commonly cultivated in India) is known as 'karro' by the aborigines of the Mitchell River in northern Queensland. The small tubers of *D. transversa* (Long Yam) are eaten by the aborigines without any preparation. The tubers of *D. hastifolia* form a large portion of the food-supply of some Western Australian natives; it is said to be the only plant which they cultivate. In the inland districts the name 'yam' is also given to species of *Vigna* (q.v.), *Vitis, Boerhavia,* and *Ipomaea* which have water-storage organs; in the southern coastal districts of New South Wales the kurrajong (q.v.) is known as 'yam' or 'yam-tree' for a similar reason. Many Australian plants are subjected to long periods of comparative drought, and it is not surprising that they should provide against this by storing moisture, usually in underground expansions of the stem (tubers); *Eupomatia, Jasminum,* and many orchids do this, besides the genera mentioned above.

Yarra Herring. See HERRINGS.

Yarran. See ACACIA.

Yarra River, NAME OF. See WEDGE, J. H.

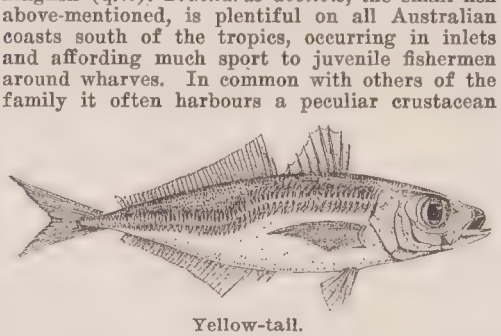
Yeast. During 1917-18 investigations were made at the Sydney technical college by H. G. Chapman (professor of physiology at the university of Sydney) with the object of obtaining 'races' of yeast that will produce more rapid ripening of doughs in bread-making. One ounce of hops was placed in about three quarts of water in an enamel bucket, and the mixture boiled 20 minutes; the liquid was then strained off. When the temperature had fallen to somewhat above 155° F., 2 lb. of crushed malt and ½ lb. of flour were added to the liquor, and the mixture was maintained at this temperature for two hours (in later experiments the time was often extended to five hours). The wort was strained from the extracted malt, and its volume made up with water to just less than 1 gallon, by filling up to a mark on the bucket; it was then poured into an enamel stewpan, in which the gallon formed a layer of about an inch on the bottom. The stewpan was heated until the wort boiled vigorously, the lid was placed on, and the contents allowed to cool. When the temperature reached 80° F., yeast from the previous stock was added, and the lid replaced. (Yeast 'from the previous stock' is obtained by taking a covered pint-dipper rinsed with boiling water within and without, and removing a full dipper of the yeast when the stewpan of yeast is first uncovered; this stands in a clean cupboard to settle for five or six hours, the yellowish liquor is poured off just before use, and the yeast, as has just been said, is added to the wort.) This mixture was vigorously beaten for five minutes with an egg-whisk that had been rinsed in boiling water, and the beating repeated an hour later. The yeast then stood for 15 hours in the covered stewpan, the temperature being maintained at 80° F.; when it was uncovered, the stock for the next growing was removed, after gentle agitation of the stewpan to mix the settled yeast with the liquor.

This method of growing yeast insures it against noticeable contamination of the wort with moulds or acid-forming bacteria. The aeration insures more rapid multiplication, since the rate of multiplication of yeast-cells in each growing is about 10 times. Only in this way has it been possible to obtain a sufficient weight of yeast to ripen the dough in five or six hours. With less yeast in the sowing the final weight of yeast per gallon is less, though the rate of multiplication is faster. H.G.C.

Yellowbelly. See GOLDEN PERCH.

Yellow-mouthed Sea Perch. See EMPEROR BREAMS.

Yellow-tail. In New South Wales and Queensland this name is applied to a small fish of the family Carangidae, but the yellow-tail of Victoria, Tasmania, and South Australia is a larger relative, known in the Sydney markets as kingfish (q.v.). *Trachurus declivis,* the small fish above-mentioned, is plentiful on all Australian coasts south of the tropics, occurring in inlets and affording much sport to juvenile fishermen around wharves. In common with others of the family it often harbours a peculiar crustacean



Yellow-tail.

parasite, which attaches itself firmly by means of hooked claws to the tongue or throat of its host, and commonly attains such a large size as apparently to prevent the fish from feeding. Young yellow-tails seek protection from sea-birds beneath the umbrellas of jelly-fish, whose stinging powers perhaps afford additional safety from the attacks of marine animals. An allied species (*T. novae-zelandiae*), known as horse mackerel in the southern and western States and cowanyoung in New South Wales, is very closely allied to the well-known horse mackerel of English markets; though occasionally entering harbours in vast shoals, it is commoner in the open sea, where it attains a length of 18 inches. A.R.McC.

Yellow-wings. See HONEY-EATERS.

Yellow-wood. See ANACARDIACEAE, FLINDERSIA, and RUTACEAE.

Young, BLAMIRE, born at Londesborough in Yorkshire in 1862 and educated at the Walthamstow Forest School and Pembroke College, Cambridge (B.A., 1884; M.A., 1891), in January 1885 migrated to New South Wales to be-

come assistant-master at Katoomba College on the Blue Mountains. He had already at Cambridge practised water-colour drawing, and in 1887 built a studio at Katoomba; there Phil May (q.v.) struck up a friendship with him, used the studio as his country headquarters, and decorated it with paintings that were unfortunately destroyed by fire in 1892. Under May's tuition Young studied oil-painting, and in 1893 abandoned schoolmastering and returned to England, where he worked at Herkomer's art-school at Bushey and with the 'Beggarstaff Brothers'—James Pryde and William Nicholson. In 1896 he came back to Australia and joined Lionel and Norman Lindsay in producing 'poster' advertisements—to the great beautification of Melbourne hoardings. The long period of struggle that ensued came to an end in 1911, when an exhibition of impressionist landscapes in Melbourne, followed by one in Adelaide early in 1912, a second in Melbourne, and one in Sydney, brought him prominently before the public and enabled him to revisit England. There during the war of 1914-18 he served as instructor in musketry and machine-gunnery to the Kitchener armies and succeeding reinforcements. After demobilization turned to art again and in 1920 made an English reputation with 'The Shadow of Hunger,' exhibited at the Royal Academy. In 1923 he once more came back to Australia. He is a member of the Royal Institute of Painters in Water Colours and of the Royal Society of British Artists, and is represented in the Sydney, Melbourne, Adelaide, and Geelong galleries and in the Victoria and Albert Museum in London (see ART). He is the author of several plays —'Art for Art's Sake' was produced at the Melbourne Repertory Theatre in 1911—and in 1923 he published a monograph on Goya (*The Proverbs of Goya*).

See J. F. Bruce's *The Art of Blamire Young* (Sydney, 1921). W.M.

Young, SIR GEORGE (1732-1810), born at Bere Regis in Dorset on 17 June 1732, served under Boscawen in 1746, accompanied him to India in 1747-8, and entered the service of the East India Company. Rejoining the navy in 1757 (lieutenant, 1761; commander, 1768; captain, 1777; rear-admiral, 1794; vice-admiral, 1799; admiral, 1804), he was present at the capture of Louisbourg (1758), Quebec (1759), and Havana (1762) and later served on the West African and Indian coasts, but saw his first fighting there in 1778. In 1781 he was elected a fellow of the Royal Society. In 1784 he with Banks and others actively supported the proposals of James Mario Matra (q.v.) for the establishment of a settlement in New South Wales; and Young wrote a report (reproduced in facsimile at Sydney in 1888) in which he recommended Botany Bay (*a*) as a centre for trade with South America and a naval base in case of a war with Spain, (*b*) as a port of call for ships trading between England and China—and proposed that the settlers should be mainly Chinese, Tongans, and convicts, with a leavening of 'loyalists' from the just lost United States, and a few Englishmen 'possessed of the useful arts.' He seems to have contemplated leading such an expedition himself either to New South Wales or to Madagascar, but the East India Company used its influence to have the proposal, at any rate in so far as Madagascar was concerned, set aside. In 1788 Young unsuccessfully applied for a lease of Norfolk Island, and in 1791 interested himself in the colonization of Sierra Leone. He died in England on 28 June 1810. (Kt. Bach., 1781.)

Young, SIR HENRY EDWARD FOX (1808-1870), third son of Sir A. W. Young, Peninsular veteran and West Indian official, was born in Kent on 23 April 1808 and educated for the law, but entered the colonial service and was sent in 1833 to St. Lucia and transferred in 1835 to British Guiana as government secretary. In 1847 he was appointed lieutenant-governor of the eastern province of The Cape Colony, and next year was made governor of South Australia. There Young found himself enmeshed in the agitation for responsible government, and was censured by the colonial office for ill-advised publication of the agitators' programme. During his term of office two events gravely affected the colony—the grant of responsible government in 1850 (which Young established with very little friction), and the discovery of gold in Victoria, which almost depopulated South Australia. Young promptly established a gold-escort to bring the South Australian miners' winnings to Adelaide, and then coined gold, and made bullion legal tender (see CURRENCY)—for this the colonial office injudiciously rebuked him. He was chiefly responsible for the initiation of an extensive system of main roads, for the introduction of district councils in local self-government (they had proved effective at the Cape), and for the opening up of the River Murray to navigation as far as Swan Hill in Victoria, in co-operation with Francis Cadell (q.v.).

In 1854 Young was appointed governor of New Zealand; but it was intended to establish responsible government in Tasmania, and his success in South Australia led the British government to cancel the New Zealand appointment in favour of Tasmania. There he came into conflict with the old council over its attempt to investigate the convict system—which Young, backing the comptroller J. S. Hampton (q.v.), considered an imperial and not a local affair. When, however, the new constitution had been set going, Young assumed his legitimate place in the scheme and became very popular. During his term of office higher education was improved, the mining industry was encouraged, and a submarine cable was (1858) laid to the mainland. He retired in December 1861, and died in London on 18 September 1870. (Kt. Bach., 1847; C.B., 1854.)

Young, SIR JOHN. See LISGAR, BARON.

Z

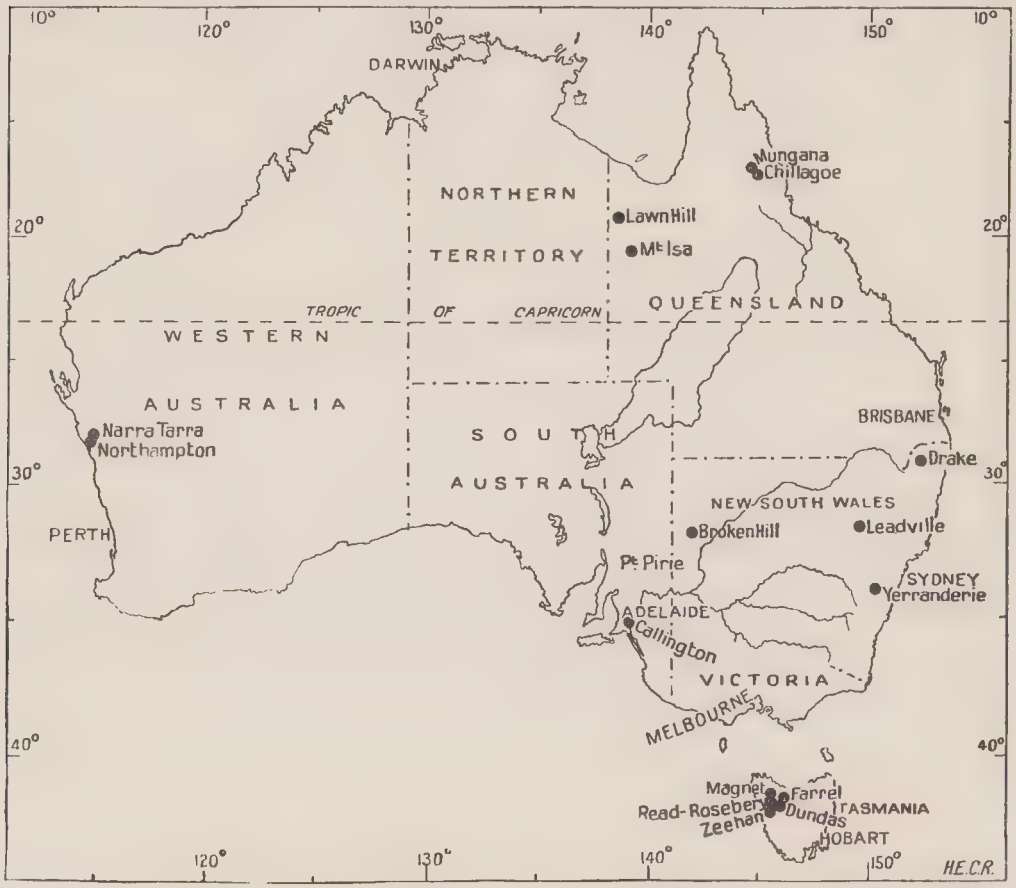
Zeolites. See MINERALOGY.

Zieria, a genus of the family Rutaceae, consisting of ornamental undershrubs with opposite trifoliate leaves. Twelve species are endemic in Australia, chiefly in its eastern areas. The calyx is 4-lobed; petals 4. *Z. Smithii* (Stinkwood) has a powerful odour. From the leaves pale-yellow oil is distilled, which has the odour of rue. The shrub has a tough, yellowish wood, which readily shrinks, and a yellow bark which in the past was locally used for dyeing native (Australian dyes have almost become extinct through the competition of chemical dyes). *Z. involucrata,* a rare species, was discovered on the Blue Mountains by James Backhouse (q.v.).

Zigzag, THE. See RAILWAYS AND TRAMWAYS.

Zinc. Practically the only source of zinc in Australia at the present day is the Broken Hill (q.v.) district of New South Wales, where blende is one of the chief constituents of the sulphide ore deposits. For many years after the opening up of the mines the zinc contents were left in the 'tailings,' but since 1909 methods have been employed which recovered the greater part of the zinc contents of ores as they were won, and made it profitable to treat the immense heaps of tailings. In 1899 the export of zinc totalled 49,879 tons, in 1910 it was 468,627 tons; when the tailings had been dealt with the tonnage naturally fell off, and in 1924 was only 270,523. Zinc also occurs at Mount Stewart in New South Wales and in the Stanthorpe and Herberton districts of Queensland, and enormous deposits of zinc-lead ore have been located on the upper Pieman behind Zeehan in Tasmania.

Before the war about 2 per cent of the



Principal deposits of lead, zinc, and silver ore.

Broken Hill zinc concentrates were smelted at Port Pirie in South Australia, some 20,000 tons were exported to the United Kingdom and smelted at the works of the Sulphide Corporation, and the bulk of the remainder was despatched to smelters in Belgium and Germany under long-term contracts. Although the Broken Hill deposits were the most important in the British Empire, up to the outbreak of the war the output from Australian smelting-plants was too small to matter. At the outbreak of war enormous quantities of zinc concentrates awaited shipment from Australia, but British smelters were unable to treat them. The completion of the Tasmanian government's hydro-electric (q.v.) installation opened the way for their metallurgical treatment in the Commonwealth. The electrolytic deposition of zinc from solution consumes more energy than that of almost any other common metal. Therefore, as zinc is comparatively low-priced, its extraction must be located where electric power is cheap. The Tasmanian installation supplied this factor, and, following the completion of a contract for power, the Electrolytic Zinc Company of Australia was inaugurated, to produce on a large scale within the Empire high-grade zinc and other products.

The electrolytic process can be divided into four main stages, the roasting of the concentrates, the leaching and purification of solutions, the electrolysis of purified zinc sulphate solutions, and the melting of the electrolytic zinc into ingots. In the first stage the aim is to roast the sulphide ores so as to obtain the maximum percentage of soluble zinc compound, either as oxide or sulphate. This is accomplished in mechanically rabbled multiple-hearth furnaces, which are so regulated as to do the roasting with the minimum consumption of extraneous fuel, and produce a gas in which the sulphur content is sufficiently high to allow its economical recovery as sulphuric acid. The roasting units are therefore operated in conjunction with existing sulphuric acid plants, and by this means the sulphuric acid requirements of Australia are assured.

The calcines produced in roasting are next agitated in a dilute sulphuric acid solution, when the zinc contents of the calcines go into solution. By a system of filter-pressing and of counter-current washing the solutions containing the zinc are separated from the gangue, and impurities in the solutions are then eliminated. The chief impurities are cadmium, cobalt, arsenic, antimony, and iron.

In the third stage the purified solution is delivered to the electrolytic cell, in which are placed sheet-lead anodes and sheet-aluminium cathodes. The zinc is deposited in a thin layer on the cathode, and removed from time to time. The 'spent' electrolyte flows back to the leaching building to be used again. The cathode zinc is remelted in an ordinary type of reverberatory furnace; but in the melting process care is taken to counteract the strong affinity of zinc for oxygen, whereby zinc oxide would be formed with a correspondingly low recovery of metallic zinc. The molten zinc is moulded into ingots which are from 99.85 per cent to 99.95 per cent pure. The output of the hydro-electric works includes electrolytic zinc, zinc oxide, lithopone, rolled zinc, and other forms of the metal suitable for special purposes. See MINERALOGY.

Zircon. See GEMSTONES and MINERALOGY.

Zizyphus, a genus of the family Rhamnaceae, consisting of trees or shrubs, mostly armed with prickles, ranging over tropical and subtropical regions. Three species are indigenous to Australia. *Z. Jujuba* (Jujube Tree), a Queensland species, extends to India, where the leaves are regarded as valuable cattle-fodder. It is a tall shrub, with small greenish flowers and succulent globular fruits much esteemed for the table when improved by cultivation, and largely cultivated by the Chinese, who recognize several varieties. The French prepare a demulcent from them. The wood makes a good charcoal. *Z. oenoplia,* a northern Australian species, also extends to India; it has an edible fruit, and is cultivated as a hedge-plant.

Zoogeography. The study of the geographical distribution of animals and plants throws light not only on the animals and plants but also on the history of the lands in which they live. An area inhabited by many species or genera peculiar to it has probably been long isolated from other parts of the earth; conversely, the existence in two now separated areas of a common stock of certain animals or plants indicates an earlier connection between those areas. The length of isolation, or the distance in time of such a connection, is measurable by the amount of change in the fauna and flora.

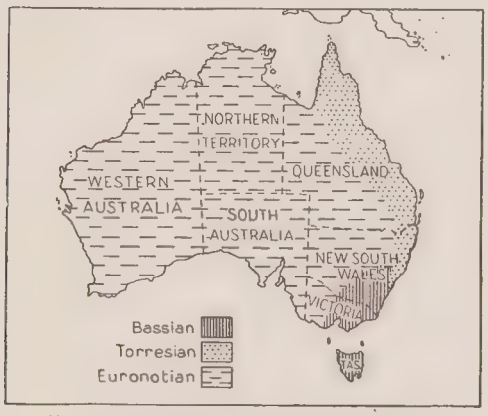
A salient character of the Australian fauna is the absence of the large animals found elsewhere. Though the climate is favourable and the country might easily support them, there is a lack of animals of high and late development—monkeys, tigers, bears, wolves, cattle, deer, horses, or pigs; and this is true not only of New Zealand and Australia, but also of New Guinea and several neighbouring islands. When we pass northwards and westwards to Java, Borneo, and the Philippines, we suddenly return to the familiar and widespread types of the world at large. The explanation is simple; ever since these advanced types came into existence, there has been a gap, impassable to non-flying animals, between the Sunda and the Spice islands. Taking advantage of movements of the land, animals have travelled to and fro, some on the hither, some on the farther side of this gap, but not across it. The boundary is known as 'Wallace's Line.'

The last land animals (excluding birds) and plants to arrive in Australia entered when an isthmus extended from Queensland across Torres Strait to Papua; this body of immigrants has been named by Sir W. Baldwin Spencer the 'Torresian.' Across the isthmus, plants and animals travelled both to and from Australia, and a few eucalypts—as well as a considerable body of vertebrates, including marsupials, a monotreme, some poisonous snakes, and tree-frogs—took the opportunity of entering Papua. Along the eastern coast of Australia, between the Pacific and the main watershed, are scattered plant-communities which in the far north are almost pure Papuan. Local residents call these Papuan oases 'scrubs' or 'brushes,' in contrast to the 'forest' or open vegetation which surrounds them. The transition from one to the other is abrupt. Where soil is rich, rainfall heavy, and temperature high, the scrubs or brushes are developed as dense jungle, matted with vines, jewelled with palms and bedecked with epiphytic ferns and orchids. This association ranges south to Illawarra in New South Wales, and extends west to the Northern Territory. In the north these Papuan woods

are accompanied by a strictly Papuan fauna, e.g. the cassowary and rifle-bird, among butterflies the Ornithoptera, among mollusca the operculate snails. The community is generic rather than specific.

It seems probable that the Torresian isthmus had an interrupted existence—that it existed in Tertiary times and then vanished to reappear in post-Pliocene times. The Tertiary isthmus is implied by the spread and change of Australian stock (such as the cuscus and the cockatoo) in islands peripheral to Papua, and by the recurrence on the alpine zone of Papuan mountains of southern types of plants and animals, e.g. *Araucaria, Podocarpus,* and *Hibbertia.*

A still earlier chapter in Australian zoogeography is concerned with the Antarctic invasion. This element—named by Spencer the Bassian—includes the mass of the vertebrate

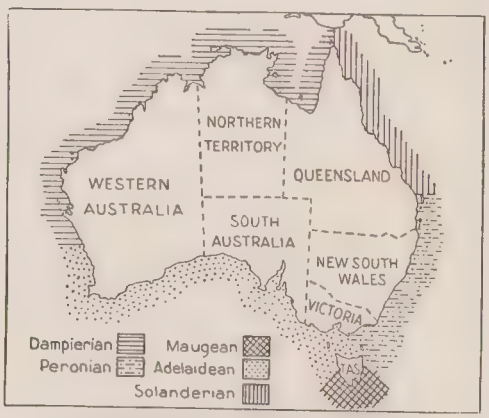


Zoogeographical divisions (terrestrial).

and the larger part of the invertebrate population, as well as most of the southern flora. It is the most characteristic section of the Australian fauna, and its chief seat is in Tasmania and the south-eastern part of the continent. At some distant time, vaguely indicated as late Mesozoic or early Tertiary, both the climate and the shape of the Antarctic continent differed from those of to-day; a mantle of evergreen forest preceded the present Antarctic ice-sheets, and dry land—though neither continuous nor contemporaneous—extended from Antarctica to South America on the one side and to Australia on the other. At a still earlier period temporary connections had been established between Antarctica and other southern continental lands. Temperate South America, then separated from the northern lands and possessed by a primitive fauna, seems to have been the source of the marsupials and monotremes, as well as of many birds and reptiles, such as the struthious birds, tortoises, and cystignathous frogs. The third and oldest constituent is that called by Professor Tate the Autochthonian and by Spencer the Eyrean. It is developed in the centre and west of the continent, and consists chiefly of snails, insects and their congeners, and of plants like *Epacris* and *Adansonia.* There is little to show when or whence it came, but its affinities are with South Africa.

From a study of the Coleoptera, T. G. Sloane has mapped a series of subdivisions of the three main areas. So long have these elements been established that they have adjusted themselves to their surroundings and harmonized with each other. They have also progressed in the direction of local evolution; for such typically Australian groups as the kangaroos among marsupials, brush-tongued lories among birds, and eucalypts among trees, appear to have been developed within the continent. In quite recent geologic times specific differentiation has been accelerated by physical and climatic impulses. E. C. Andrews has shown that until recently a vast peneplain occupied the east coast, and Howchin states that in the south and centre a radial drainage then prevailed. When the east-coast ranges arose, and the central river-system was interrupted, both rainfall and rock-exposure were profoundly modified. This led to the extinction of unsuitable forms, and the birth of new species to take their place.

In marine zoology, the Australian fauna has been divided by Hedley into four provinces, two



Zoogeographical divisions (marine).

tropical and two temperate. The first, the Solanderian, inhabits the waters of the Coral Sea from Torres Straits to Wide Bay, including the Great Barrier Reef. The second lies in the Tasman Sea between Brisbane and Hobart; its southern extremity has recently been separated by Iredale and May as the Maugean. An isthmus which connected Tasmania with Victoria, and served to transport the Bassian migration, also held asunder the marine fauna of the Pacific from that of the Indian Ocean. So from Melbourne to Perth there extends the Adelaidean fauna—which for so vast an extent is remarkably uniform. The last element, the Dampierian, reaches from the Abrolhos islands to the Gulf of Carpentaria.

See Andrews's 'Evolution of Eucalypts' in the *Report* of the British Association for the Advancement of Science (1915); Dannevig's *Biological Results of the Endeavour* (1915); Haswell's 'Animal Life in Australia' in the *Federal Handbook* of the British Association for the Advancement of Science (1914); Hedley's 'Zoogeographic Scheme of the Mid-Pacific' and 'Palaeographical Relations of Antarctica' in the *Proceedings* of the Linnean Society of New South Wales (1899) and London (1912); Howchin's 'Physiographical Features of South Australia' in the *Report* of the Australasian Association for the Advancement of Science (1914); Iredale and May's 'Tasmanian Chitons,' etc. in the *Proceedings* of the Malacological Society (1916); Sloane's 'Faunal Sub-regions of Australia' in the *Proceedings* of the Royal Society of Victoria (1915); Spencer in *Reports* of the Horn Expedition (1896); and Harrison's presidential address in the *Australian Zoologist* (vol. iii).

C.H.

Zoological Gardens. The first zoological gardens in Australia were opened in 1854 at Botany near Sydney by William Beaumont, licensee of the Sir Joseph Banks hotel. Contemporary illustrations show that it included at least elephants, emus, kangaroos, and a dingo. The animals were afterwards removed by Beaumont's successor Billing to a hotel at Watson's Bay. When Billing died, his widow offered the collection to the New South Wales government, and when the offer was refused poisoned the animals.

The existing zoological gardens in Melbourne, Sydney, and Adelaide were established by private citizens who founded societies primarily to acclimatize useful game-birds, fish, and other animals in their colonies; the formation of zoological collections was a secondary object. The gardens at Perth were established by the colonial government, and those near Hobart are private property. The Melbourne gardens were opened in 1863 by the Zoological and Acclimatization Society of Victoria, a corporate body in which the government vested an area of 50 acres in Royal Park, about two miles from the centre of the city. The gardens are spacious, well laid out, and planted with a variety of local and introduced trees. At the end of 1925 the most interesting animals in the collection were a pair of hippopotami and a giraffe. Large enclosures have been provided for the herbivores, so that cattle, deer, antelopes, etc., are well-shown in good grass-paddocks, tree-kangaroos may be seen in characteristic setting, and three ponds give ample space for swimming birds. There are several flight-aviaries, and the brush turkeys can generally be seen working on their extensive mound-nest. The zoological society of New South Wales was formed in March 1879, with Walter Bradley as president, for the acclimatization of song-birds and useful game; a sum of £500 was collected, the government giving £ for £ subsidy, and pheasants, California quail, and several species of song-birds were imported and liberated. In 1880 the society was reorganized as the Zoological and Acclimatization Society, and a depot was established at Moore Park, laid out as zoological gardens, and opened in 1884. The area of the gardens was gradually extended to 11 acres as the collection of animals and birds increased. In 1916 the collection was removed to Taronga Park, a site of about 58 acres on the north side of Sydney harbour, set apart by the government for that purpose, and vested in trustees selected from the council of the society—to whom the zoological collection was also transferred. For the houses and cages of Moore Park were substituted large enclosures that provided an approximation to natural conditions; the indigenous trees and shrubs were preserved as far as possible, and only Australian flora has been added. The space (about 30 acres) allotted to the animals is divided into sections to enable the several orders to be appropriately grouped.

The South Australian Zoological and Acclimatization Society came into existence in 1878, and the gardens which it controls were constructed shortly afterwards. They are situated on the Torrens, close to the city, adjoining the botanical gardens. The area is small and the exhibits are crowded, but there is a good collection of animals, and most of the birds have flight-aviaries. Of special interest are a pair of American bison and a pair of Burchell's zebras; the lions, too, are better than are usually seen in zoological collections.

The gardens at Perth, which are controlled by the Western Australian Acclimatization Committee, were established by the colonial government and opened to the public in 1898. The grounds are about 60 acres in extent, but only about half the area is used for exhibition purposes. The collection of animals is small, but in good condition, and the breeding of wild animals is more successful than in any other gardens in the Commonwealth. The water-supply comes from a deep artesian bore, and reaches the surface at a temperature of 103° F.; this enables some tropical animals and reptiles to be kept at the constant temperature so beneficial to their health and appearance.

At Beaumaris near Hobart Mary Roberts has a small private collection of animals and birds, principally Australian. She has been successful in keeping the Tasmanian Wolf and Tasmanian Devil, two large carnivorous marsupials found only in Tasmania. A.S.LeS.

Zoophytes. See HYDROID ZOOPHYTES.

PRONUNCIATION OF CERTAIN NAMES AND TERMS

Those who first gave to *Polynesian* and *Melanesian* words a systematic representation in written symbols, did so on proper phonetic principles. Hence the vowels and diphthongs of those languages should be pronounced with their 'continental,' not with their English, values. Thus, roughly,—

a = *ah* (the *a* in *father*);
e = *ay* (in *day*), when long, or = *e* in *get*, when short;
i = *ee* (in *see*), when long, or = *i* in *sit*, when short;
o = *o* in *go*, when long, or = *o* in *got*, when short;
u = *oo* (in *cool*), when long, or = *u* in *full*, when short;
au = *ah* + *oo* (pronounced quickly together);
ai = *ah* + *ee* (pronounced quickly together);
ao = *ah* + *o* (pronounced quickly together).

But whereas the English-speaking inhabitants of the regions concerned generally pronounce the simple vowels with fair accuracy, they have commonly corrupted the unfamiliar sounds of the diphthongs, and pronounce—

au and *ao* as English *ow* in *how*, *now*;
ai as English *i* in *mine* or *y* in *shy*.

The 'velar nasal' *ng*, which should be pronounced as in *singer*, is commonly treated as if it were *ng* + *g* (like *ng* in *finger*). Thus, *Tonga* is properly *Tong-* (as in *tongs*) + *a* (i.e., *Tong'-a*), but is commonly heard as *Tong'-ga*.

Meanwhile in the orthographic representation of *Australian* aboriginal words (which were largely left to the mercy of settlers without philological training) there has been no such phonetic consistency, and the rules given above do not apply. Moreover it is a peculiar practice of English to lay a pronounced stress accent on one syllable of a word at the expense of the rest, and in these latter the vowel is apt to be slurred into an 'indeterminate.' Hence, while *Geelong*, for example, is properly *Jee'-long'*, the tendency is to pronounce the name as *Jĕ-long'*.

In the following brief miscellaneous list the sign – (over a vowel) means that the sound is full or 'long,' and the sign ˘ that it is 'short.' The sign ′ denotes the syllable which bears an accent. The pronunciations supplied are those which would be used if the words were read as English (not as 'continental').

Aorangi—Ah′-o-rang′ee, currently Ow-rang′-y.
Barcoo—Bar-coo′.
barracouta—barr′-ă-coot′-ă.
Bega—Bee′-gă.
Berrima—Berr′-ī-mă.
Bogong—Bō′-gong or Boo -gong.
Bombala—Bom-bāh′-la.
Bondi—Bon′-dī.
Bowral—Bough′-răl.
Bruni—broon′-y.
Bulli—Bull′-eye.
burrawang—burr′-ă-wong.
Canberra—the correct and official accentuation is Can′-bĕr-ă, but Can-berr′-ă is commonly heard.
Chillagoe—Chill′-ă-gŏ.
Cobar—Cō′-bar.
Colac—Cōh′-lack′.
Condobolin—Con-dō′-bŏl-in.
Connewarre—Con′-ă-worr′-ă.
Coogee—currently Coo′-jy (the first syllable as in *could*).
coolabah—Cool′-ă-bah.
Corangamite—Cŏ-rang′-(g)ă-mīte.
Corio—Cō-rī′-ō.
Corowa—Corr′-ŏ-wă.
corroboree—cŏ-rob′-ĕr-y.
coucal—coo′cal′.
Deniliquin—Dĕn-il′-î-quin.
Diamantina—Di′-a-man-tee′-nă.
Dimboola—Dim-bool′-ă.
dugong—doo′-gong.
Echuca—E-chew′-kă.
Enoggera—E-nogg′-ĕr-ă.
Gabo—Gay′-bō.
galah—gă-lāh′.
geebung—jee′-bung.
Geelong—Jee′-long′.
gibber—gib′-bĕr (not jib-).
gin—jin.
Gundagai—Gun′-dă-guy.
Gunnedah—Gun′-ĕ-dah.
Gympie—Gim′-py (not Jim-).
Jenolan—Jĕ-nō′-lan.
Jerilderie—Jĕ-ril′-dĕr-y.
kanaka—kă-nah′-kă (currently ka-nack′-a).
Kalgoorlie—Kal-goor′-ly.
Kanowna—Kă-now′-nă.
Katoomba—Kă-toom′-bă.
kauri—kah′-o-ree (currently cow′-ry).
Kerang—(currently Kĕ-rang′).
Kiama—Kī-amm′-ă.
koala—kŏ-āh′-lă.
Leeuwin (Dutch)—Lew′-in.
mallee—mall′-y.
manuka—mah′-nŭ′-kă.
Maori—Mah′-ŏ-ree (currently Mow′-ry, as in *mouse*).
Maranoa—Marr′-ă-nō′-ă.
Menindie—Men-in′-dy.
Mia-mia—Mī-ă-mī′-ă (currently mī′-mī).
Mildura—Mil-dew′-ră.
Monaro—currently Mŏn-air′-ŏ.
Mudgee—Mud′-jy.
Mulgoa—Mul-gō′-ă.
Murrumbidgee—Murr-ŭm-bid′-jy.
Nagambie—Nă-gam′-by.
Narrandera—Nar-an′-dĕr-ă.
Nauru—Nah′-o-roo′, currently Now-roo′.
Nepean—Nĕ-pee′-an.
Numurkah—Nu-mer′-kă.
Omeo—ō-mĕ-ŏ.
Onkaparinga—Onk-ă-pă-ring′-(g)ă.
pandanus—păn-dā′-nŭs.

Papua—Pah′-poo-ăh (not Pa-poo′-a).
paspalum—păs′-pā-lŭm.
Pilbara—Pil-bāh′-ră.
pittosporum—pĭ-tos′-pŏ-rum.
Prahran—currently Prā-ran′.
Rabaul—currently Ră-bowl′ (as in *bowel*).
Raratonga—Răh′-ră-tong′-ă (currently -tong-ga).
Taronga—currently Tă-rong′-gă.
ti-tree—tee′-tree.
Tonga—Tong′-a, currently Tong′-gă.
Tongatabu—Tong′-ă-tă-boo′.
Toorak—Tŭ-rack′.
Toowoomba—Tŭ-woom′-bă.
trevalla, trevally—trĕ-vall′-ă, trĕ-vall′-y.
Tumut—Tew′-mut.
Wagga Wagga—Wogg′-ă Wogg′-ă.
Wahroonga—currently Wă-roong′-(g)ă.
Waikato—currently Wī′-kat′-ŏ.
Waimate—currently Wī′-mat′-y.
wallaby—woll′-ă-by.
Wangaratta—currently Wong-(g)ă-rat′-tă (sometimes Wang′-).
waratah—worr′-ă-tah.
Warrego—Worr′-ĕ-gŏ.
warrigal—worr′-ĭ-găl.
Warrnambool—War′-năm-bool′ (as in *war*).
Wimmera—Wimm′-ĕr-ă.
Witchetty—Witch′-ĕ-ty.
Wodonga—Wŏ-dong′-(g)ă.
Wombeyan—Wom′-bĕ-ăn.
Woolloomooloo—Wool′-oo-mool-oo′.
woomera—woom′-ĕr-ă.
Wycheproof—Witch′-ĕ-proof.
Yan Yean—Yan′-Yeen′.
Yarrangobilly—Yarr-ăn-gŏ-bill-y.

SUPPLEMENTARY LIST OF CONTRIBUTORS

A.H.Ch.	ALFRED HENRY CHESTERMAN, Surveyor-general of New South Wales and Chairman, Closer Settlement Board.
A.H.MacK.	ARCHIBALD HERBERT MACKENZIE, Senior Constable and Lecturer Instructor, Victorian Police Force.
A.W.A	ALBERT WILLIAM ANDERSON, Field Secretary, Australian Union Conference of Seventh-day Adventists.
A.W.T.	ALFRED WILLIAM TURNER, Secretary of the Government Savings Bank of New South Wales.
B.M.	BRONISLAW MALINOWSKI, Ph.D. (Cracow), D.Sc. (Lond.), author of *Argonauts of the Western Pacific, The Family Among the Australian Aborigines*, etc.
B.R.G.	BENJAMIN RICHARD GELLING, Past President, Rotary Club of Sydney; Commissioner, Rotary International for New South Wales.
C.E.C.	CLARENCE EDWARD COWLEY, Lecturer in Charge, Sheep and Wool Department, Technical College, Sydney.
C.E.W.B.	CHARLES EDWIN WOODROW BEAN, Editor of the *Official History of Australia in the War of 1914-1918.*
C.H.B.	CHARLES HENRY BERTIE, Librarian of the Sydney Municipal Library, Past President and Fellow of the Royal Australian Historical Society.
C.McD.	CHARLES MCDONNELL, Shearing Contractor, Sydney.
C.P.	CECIL PURSER, M.B., Ch.M., Deputy Chancellor, University of Sydney.
D.G.S.	DAVID G. STEAD, Rabbit Menace Enquiry Commissioner, New South Wales.
E. Le G.T.	ELLIS LE GEYT TROUGHTON, Mammalogist, Australian Museum, Sydney.
E.M. de B.	ERNEST MACARTNEY DE BURGH, Chief Engineer for Water-supply and Sewerage, and Chairman of Expert Committee on Hydro-electric Development, New South Wales.
F.J.Br.	FREDERICK JOHN BROOMFIELD.
F.McK.	FIRMIN MCKINNON, Associate Editor, *Brisbane Courier.*
G.A.J.	GEORGE ALFRED JULIUS, B.Sc., B.E., Chairman of the Council for Scientific and Industrial Research, Commonwealth of Australia.
G.W.	GILBERT WHITE, D.D., formerly Lord Bishop of Willochra.
H.S.G.	HENRY SOMER GULLETT, M.H.R., author of *The Australian Imperial Force in Sinai and Palestine 1914-1918.*
J.F.B.	JAMES F. BRUCE, M.A., Associate Professor of History, University of Sydney.
J.L.S.	JOHN LLOYD STREVENS, Consulting Oil Technologist, Sydney; sometime Oil Technologist, Mines Department, Victoria.
J.P.McG.	JOHN PERCY MCGUANNE, Fellow of the Royal Australian Historical Society.
K.B.	KENNETH BINNS, Librarian in Charge, Commonwealth National Library.
L.A.W.S.	LINDSAY ALAN WADE SOUTTER, B.Ec. (Syd.), Financial Editor, *Daily Telegraph*, Sydney.
L.G.D.	LESLIE GORDON DAVIDSON, M.B., Ch.M., Ophthalmic and Aural Surgeon, Sydney.
L.G.W.	LIONEL G. WIGMORE, Journalist.
P.R.W.	PERCY RICHARD WATTS, LL.B., Lecturer on Modern Political Institutions and Reader in Conveyancing, University of Sydney.
R.J.M.W.	ROBERT JOHN MOORE WITHERS, Secretary of the Sydney Wool Selling Brokers' Association.
R.L.K.	ROBERT LUCIAN KALESKI, Agricultural and Timber Expert, Farmer and Grazier.
R.T.F.	REGINALD T. FOSTER, Associate Editor of *The Register*, Adelaide.
T.J.S.	THOMAS JOLLIE SMITH, M.A., Professor of Hebrew and Old Testament Studies Ormond College, within the University of Melbourne.
W.F.B.	WILLIAM FREDERICK BURROW, Supervising Engineer, Metropolitan Railway Construction, Sydney.
W.La.	WILLIAM LAWLESS, 'Solar Plexus' of *The Referee*, Sydney.
W.W.T.	WILLIAM WALFORD THORPE, Ethnologist, Australian Musuem, Sydney.

The illustrations of fossil insects in the article on Palaeontology are reproduced by courtesy of the Linnean Society of New South Wales.

Eagle Press, Allen Street, Waterloo, Sydney.